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AT HARVARD COLLEGE

Vol. XCI, No. 1

THE LIZARDS OF BRITISH SOMALILAND

By H. W. Parker, M.A.
Department of Zoology, British Museum
(Natural History)

With an appendix on *Topography and Climate*

By Capt. R. H. R. Taylor, O.B.E.

CAMBRIDGE, MASS., U.S.A.

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INTRODUCTION

The herpetology of British Somaliland offers a peculiarly interesting field for research, and a glance at the bibliography appended to the present paper indicates that it has already received a considerable amount of attention. The absence of roads and railways has hindered the complete exploration of the country so that, until recently, the collections obtained have been meagre and restricted to the more accessible districts. But the British Museum was singularly fortunate in the fact that Capt. Taylor, who served on the two boundary commissions which have surveyed the whole of the boundaries of the protectorate, took a keen interest in herpetology and has amassed what is undoubtedly the finest collection which has yet been obtained in the region. The author has already reported upon a small part of this collection (1932), but the larger amount of material now available, makes it possible to present a tentative account of the complete lizard fauna. The author has already drawn attention to the interesting zoo-geographical affinities of the herpetological fauna of Somaliland and its outlier in the Lake Rudolf basin (1932, 1936) and the conclusions reached have been fully confirmed by the additional material. But now, though the fauna can by no means be considered thoroughly known, it is possible to make a preliminary estimate of the distribution of the species within the territory; for a better understanding of this matter a knowledge of the topography and climate is essential, so that brief sketches of these subjects by Capt. Taylor are given as appendices herewith.

Even a cursory glance at the taxonomic section of the present paper will reveal two important facts; first, the very large number of species to be found in such a relatively small area and, secondly, the very high proportion of endemic species and races. Excluding from consideration the two introduced oriental geckos, *Hemidactylus flaviviridis* Rüppell and *H. frenatus* Dum. & Bib., no less than 72 species of lizards are found in an area comparable in size with Great Britain and one which is, on the whole, not remarkable for diversity of climatic and ecological conditions. Forty-five of these species (62 per cent) are endemics, some of which show definite indications of differentiation into geographical races within the country, and, of the non-endemic species, an appreciable proportion also shows differentiation in the Somaliland area. Such a very high degree of endemism on part of a continental land-mass is remarkable in the extreme and suggests specialisation or isolation. Probably both of these factors and others, have operated in the production of the present fauna. There is manifestly quite a high degree of geographical isolation, the triangular peninsula being bounded on two sides by the sea and on part of the third side by the Abyssinian mountains and Rift valley. This purely geographical isolation is reinforced by the climatic conditions. The rainfall of the north of the peninsula is for the most part less than 20 inches annually, but in the countries to the west and south the annual precipitation rises to an average of at least 20-30 inches except in the Lake Rudolf basin which, as has been pointed out, is an outlier of the Somali arid zone and bears a strong faunal resemblance to it. (fig. 1). The geographical isolation has, apparently, existed since the beginning, for the Abyssinian Plateau is regarded by Gregory (1921) as dating from the Jurassic whilst Somaliland itself is of later date. From a geological standpoint it is a relatively new land; Gregory believes that the main elevation of the landmass which includes the peninsula, dates from the Cretaceous, but the presence of Miocene limestone (Dubar series) in the north of British Somaliland and large masses of Middle Eocene limestone in the Sol Haud and Eastern Haud (Macfadyen 1933) indicates that some of the country, at least, is of more recent origin. Separation from Southern Arabia appears to date from the Middle Pliocene (Macfadyen op. cit. p. 15).

The climatic history is not so well understood, but it is certain that there have been considerable changes since the land came into existence. A great deal of attention has been devoted to climatic changes during the Pleistocene in the countries surrounding Somaliland, but the absence of lakes renders this study difficult in the peninsula itself.

There is, however, no reason to suppose that a succession of climatic changes which extended from Palestine to Tanganyika Territory did not affect Somaliland also, and it is to be presumed that the succession

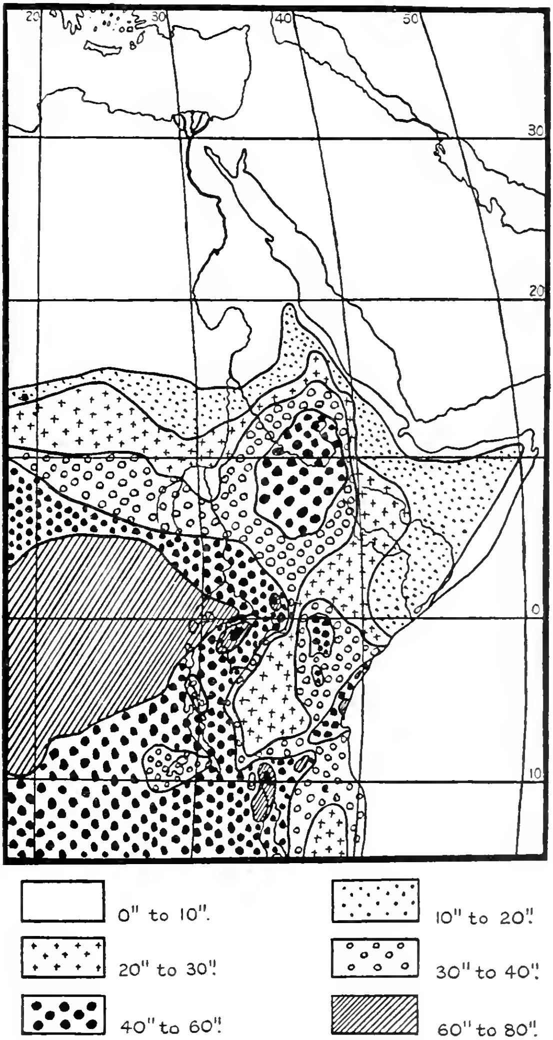

Fig. 1. Mean Annual Rainfall of N. E. Africa. (After Knox).

was the same there as elsewhere. Parkinson (1932) and Macfadyen (1932) have accumulated definite evidence that there were indeed wet periods in the area, whilst Fuchs (1939) has demonstrated a complex set of such changes in the Lake Rudolf basin (fig. 2).

Wayland (in Hale Carpenter, 1935, p. 437), basing his conclusions on the evidence obtained in Uganda and Kenya, believes that Abyssinia underwent two major pluvial periods during the Pleistocene, with a prolonged Interpluvial, and "two wet and two dry post-Pluvial (or epi-Pluvial) phases of lesser intensity". Fuchs finds evidence of 5 maximal lake-levels in Lake Rudolf and the suggestion of a very much less marked sixth (fig. 2). The first of these, which occurred at the end of the Lower Pleistocene, he correlates with Wayland's Pluvial I; the next three, placed as Chellean, Acheulian and Gamblian are correlated with Wayland's Pluvial II and the two most recent and least marked would accordingly correspond with the post-Pluvial Makalian and Nakuran wet phases. The evidence so far obtained in British Somaliland is not extensive, but the succession found by Macfadyen in the Bihendula-Dagah Shabell-Daban area is the most complete. The earliest fresh-water deposits are in the Daban Conglomerates and these are tentatively referred (Macfadyen 1933) to the late Eocene. This was followed by a phase of Posthumous faulting in the Gulf of Aden trend along the Dagah Shabell fault, which may, perhaps, be connected with the major movements which took place in Mid-Pliocene times and resulted in the separation of the peninsula from Arabia. There followed in succession (1) a period of boulder deposition, (2) a period of erosion "during what must have been a long-continued wet period", (3) the infilling of some of the valleys with the Younger Gravels and finally (4) a second period of erosion which Macfadyen believes may be the period existing to the present day. The significance of these various phases from a climatological point of view is uncertain; but it can safely be said that there must have been at least one and probably more wet periods of considerable duration during the Pleïstocene.

Thus so far as British Somaliland is concerned, it appears from the geological evidence that, after the emergence of the land in the Middle Eocene, there was opportunity for faunal invasion both from the north and south; to the westward the Abyssinian plateau probably acted as a barrier to the free movement of many animals. This state of affairs continued until the middle of the Pliocene when the formation of the Aden Gulf inhibited or seriously restricted the possibilities of colonisation from the north, and a degree of geographical isolation was imposed

which has persisted until the present time. Subsequently, alternations of wet and dry climatic conditions must have profoundly affected the

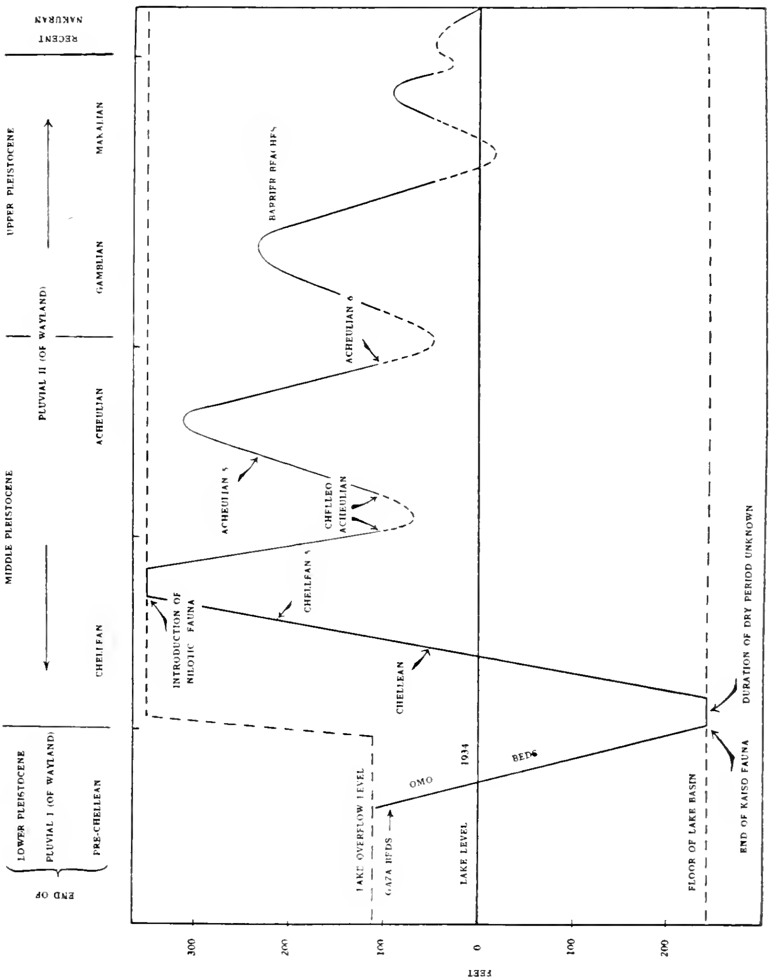

Fig. 2. Pleistocene Fluctuations in Lake Rudolf. (After Fuchs).

flora and fauna. It seems highly improbable that any of the original migrants into the country would have persisted unchanged through

these environmental changes and it is reasonable to suppose that the present lizard-fauna, adapted to the semi-desert conditions now prevailing has to a considerable extent been evolved *in situ* since the last major wet phase. It might be argued that the bulk of the changes have taken place since the latest, Nakuran, wet phase which is estimated by Brooks (1922) at about 850 B.C. If this were so it would involve a rate of evolutionary change far in excess of that usually deemed probable, but it is a possibility which cannot be entirely neglected. Moreau (1933), however, calculates that during the Nakuran wet phase the average annual rainfall of the Lake Nakuru basin was probably not more than, at most, 5½ inches greater than it is today and so can have been of little consequence. Even the Makalian period, dated between 10-20,000 B.C. by Brooks, is not believed to have had a rainfall "sufficiently greater than the present to permit of general forest growth" (Moreau op. cit. p. 431), but the Gamblian (ending about 20,000 B.C.; Brooks) seems to have been an "epoch of continuous forest" in Kenya. Of the present known lizard fauna in Somaliland not a single species can be regarded as a forest form, and if, as seems likely, conditions were similar in Kenya and Somaliland, it seems legitimate to conclude that the whole fauna has been completely changed since that time.

Analysis of the elements composing the fauna lends support to many of these views. The species, excluding from consideration the introduced species mentioned above (p. 4), can be divided into three groups as follows:

I. Northern species with an Eremian or Irano-Turanian distribution.

II. Ethiopian species.

III. Endemics.

These are listed in the accompanying tables and the approximate distribution of each species in Somaliland and elsewhere is given. The topographical divisions used by Capt. Taylor (Appendix I) are slightly modified for convenience in indicating distribution, and Ethiopia is divided into two parts, the highland plateau indicated by Ethiopia I and the Ogaden which is, of course, continuous with the Haud.

The following divisions are used in indicating distribution in British Somaliland. (1) *The Guban* (" a " of Capt. Taylor's topographical divisions); (2) *The Mountains of the Ogo.* Captain Taylor has pointed out that the northern mountain chain is interrupted eastward of the Golis ranges by the Huguf Plain and this interruption appears to coincide with the distributional limits of several species. Consequently

the mountains to the westward of this plain are included with the highland slopes of the Ogo (Taylor's "c") as a single unit. (3) *The Eastern Mountains,* comprising the highlands east of the Huguf Plain. (4) *The Sol Haud,* including the Daror Valley, (d & g). (5) *The Nogal Valley* (e) (6) *The Haud* (f). In addition, Italian Somaliland is considered under three divisions: (7) *Migiurtina* being the sultanate of that name in the extreme north; (8) *Obbia,* the central area; (9) *Shebeli & Juba,* being the southern zone comprising the provinces of Shebeli, Lower Shebeli, Upper and Lower Juba.

I. THE EREMIAN SPECIES

(Table I)

The presence of these species indicates that the present fauna is not wholly a development of the peninsula itself. They are obviously migrants from the north-west, from the true desert region where desiccation has progressed even further than in Somaliland. But from the fact that they form only about 13 per cent of the total lizard fauna it seems probable that the wet Abyssinian plateau does indeed form an effective barrier to faunal movement. It should also be noted (a) that many of them are limited to the extreme north-west, (b) that none have penetrated as far as the Lake Rudolf region and (c) that none of them show any tendency towards the formation of local races in Somaliland. This latter fact offers a very marked contrast with both the other faunal groups and the three above-mentioned facts together rather suggest the possibility that these Eremian species are recent migrants into the country and have had insufficient time to spread widely and become differentiated. But it must also be remembered that the northern coastal plain is also by far the hottest and driest part of the country (appendix p. 96) and so is essentially similar to the Saharan region; species adapted for life in the latter area will be particularly well adapted for the conditions prevailing in the Guban.

II. ETHIOPIAN SAVANNAH SPECIES

(Table II)

The second group contains 18 species (25 per cent) which have, for the most part, a "Sudanese" distribution (using the term in reference to Engler's botanical sub-province of the Savannah province) but also includes some ubiquitous species such as *Hemidactylus mabouia* de

Jonnés and *Agama agama* (Linn.). It will be noticed that (a) Many of these species with a wide range form distinct geographical subspecies and in four instances (*Platypholis fasciata, Latastia longicaudata, Rhampholeon kersteni* and *Riopa modesta*) one or more of these races is confined to the Somali peninsula. (b) In two instances the species has an "Eremian" subspecies (*Latastia longicaudata, Agama agama*) which enters Somaliland only in the dry, hot, northern zone, exactly like the species of group I (fig. 3); otherwise very few of these species are recorded from the Guban, and only two have been recorded from Southern Arabia.

III. ENDEMIC SPECIES

(Table III)

The 45 endemic species account for 62 per cent of the lizard fauna. It will be noticed that very few of them are uniformly distributed throughout the whole area and that a few appear to have, in the light of our present knowledge, a very limited distribution. Further exploration will no doubt prove that in many instances this is an illusion, but there are evidently faunal differences within the country, and a few ill-defined faunal provinces can be recognised. Best defined of all is the Guban, which, as has already been pointed out, has such marked Eremian affinities; of the 11 Somali forms found there, two are not known to occur elsewhere and at least two others (*Latastia boscai boscai* and *Philochortus spinalis*) are essentially north-western forms of Eritrea and Ethiopia. The mountains across the north of the country might be expected to form a distinctive faunal zone, and there are, indeed, a number of montane species which extend across the whole area and into the mountains of Ethiopia and Eritrea. But the Huguf plain, which breaks the mountain chain, appears to form a slight barrier, the mountains of the Ogo, to the westward of this dividing line having a richer fauna than those to the eastward. To the southward of the mountain chain, where the land slopes away gradually to the south-east, there are no obvious barriers and there is no abrupt faunal change. The species of the eastern mountains pass into the Sol Haud (and Migiurtina), whilst those of the west encroach upon the western and central Haud. But the Haud itself, together with the Nogal Valley, the Sol Haud and the Ogaden, forms what appears to be a distinctive faunal zone with a very rich fauna, of which 9 species are not found elsewhere. A number of the other species which do occur elsewhere show a tendency towards race-formation in this area though

TABLE I

	A. E. Sudan	Eritrea	Ethiopia I	S. Arabia	Guban	Mts. of Ogo	E. Mts.	Migiurtina	Sol Haud	Nogal Valley	Haud	Ogaden	Obbia	Shebeli & Juba	Lake Rudolf	Approximate distribution elsewhere
I Hemidactylus sinaitus		√			√											(Records badly confused with *H. turcicus*)
H. turcicus	√	√		√	√	√			√				√	√		Borders of Mediterranean from Spain to N.W. India
Pristurus rupestris				√	√			√								N.W. India to S.E. Arabia
Ptyodactylus hasselquisti	√	√	√	√	√											West Africa to Iran
Tarentola annularis	√	√	√		√	√										Libya to Sinai
Eremias guttulata olivieri	√	√	√	√	√	√										Rio de Oro to N.W. India
E. mucronata	√	√	√	√	√	√	√	√				√	√	√		Egypt and Palestine
Chamaeleon basiliscus	√	√	√		√	√										Nigeria to Syria
Chalcides ocellatus	√	√	√	√	√	√	√							√		Morocco and Sierra Leone to N.W. India

TABLE II

	A. E. Sudan	Eritrea	Ethiopia I	S. Arabia	Guban	Mts. of Ogo	E. Mts.	Migiurtina	Sol Haud	Nogal Valley	Haud	Ogaden	Obbia	Shebeli & Juba	Lake Rudolf	Approximate Distribution elsewhere
II																
Hemidactylus mabouia			√						√	√		√	√	√	√	Cosmopolitan except Eremian region
Platypholis fasciata fasciata																Coastal belt of Kenya and Tang. Territory
P. fasciata erlangeri									√					√		. . . .
Agama agama subspp.																Africa south of Sahara
Agama agama spinosa	√	√	√		√	√										Egypt and Sinai
Agama cyanogaster		√	√			√								√		Coastal plain and upland savannahs s. to Cape Province
Varanus ocellatus	√	√	√		√	√					√	√		√	√	Littoral rocks, coastal plains and upland savannahs in Kenya and Tanganyika Territory
Eremias spekii spekii																Coastal plains and upland savannahs in Kenya and Tangan. Terr.
E. spekii sextaeniata			√			√				√	√	√	?	√	√	Coastal plains and upland savannahs of Kenya
Latastia long. longicaudata	√	√			√	√	√						√			Senegal and N. Nigeria to Sinai
L. longicaudata revoili	√	√	.			√	√	√	√	√	√	√	√	√	√	Upland savannahs of Kenya and Tang. Territory
L. long. doriai						√										
L. long. caeruleopunctata											√					
L. long. andersoni				√												
Gerrhosaurus major major																Coastal plain and upland savannahs Kenya and N. Tang. Terr.

TABLE II, (*Continued*)

	A. E. Sudan	*Eritrea*	*Ethiopia I*	*S. Arabia*	*Guban*	*Mts. of Ogo*	*E. Mts.*	*Migiurtina*	*Sol Haud*	*Nogal Valley*	*Haud*	*Ogaden*	*Obbia*	*Shebeli & Juba*	*Lake Rudolf*	Approximate distribution elsewhere.
II — Continued.																
Gerrhosaurus m. bottegoi		√	√			√								?		Savannah from Gold Coast to Uganda and N. Kenya
G. m. grandis																Zululand, Transvaal, Mozambique and Tanganyika Territory
Chamaeleon dilepis subspp.																Almost all Africa south of the Sahara
Chamaeleon dilepis ruspolii											√	√				
Rhampholeon kersteni kersteni																Uganda, Kenya and Tanganyika Territory
R. kersteni robecchii						√		√			√	√	√	√		
Ablepharus wahlbergii			√			√		√				√	√	√		East and south of the Rain Forest to Angola and Cape Province
Mabuya striata	√		√		?	√					√	√		√		
M. varia		√	√			√	√		√		√					
M. planifrons			√			√	√				√	√				Coastal plains and upland savannah southwards to Tang. Territory
M. quinquetaeniata		√	√		√	√									√	Egypt and Senegal circum Rain Forest to Zululand
M. brevicollis		√	√	√	√	√	√	√	√	√	√	√	√	√	√	Coastal plain and upland savannahs of Kenya, Uganda and Tang. Terr.
Riopa sundevallii	√		√	√		√			√		√			√	√	East and south of the Rain Forest to Angola and Natal.
R. modesta modesta																Coastal plain and upland savannahs of Kenya and Tang. Territory
R. modesta somalica			?		?	√										

TABLE III

	A. E. Sudan	*Eritrea*	*Ethiopia I*	*S. Arabia*	*Guban*	*Mts. of Ogo*	*E. Mts.*	*Migiurtina*	*Sol Haud*	*Nogal Valley*	*Haud*	*Ogaden*	*Obbia*	*Shebeli & Juba*	*Lake Rudolf*	Approximate distribution elsewhere
III																
Hemidactylus taylori									√							
H. ruspolii											√	√		√	√	
H. curlei						√										
H. barodanus			√			√										
H. macropholis							√	√	√	√	√	√	?	√		N. Kenya
H. citernii					√				√	√						N. Kenya
H. smithi									√	√	√	√				
H. laevis						√								?		
H. somalicus									√	√	√					
H. megalops									√	√						
Teratolepis taylori											√					
T. tropidolepis										√	√	√		√		N. Kenya
T. ophiolepis			√			√					√					
T. isolepis			√			√								√	√	N. Kenya
Hemitheconyx taylori						√		√	√	√	√					
Holodactylus cornii								√		√			√			
H. africanus					√	√		√		√	√	√	√	√		

TABLE III, (*Continued*)

	A. E. Sudan	*Eritrea*	*Ethiopia I.*	*S. Arabia*	*Guban*	*Mts. of Ogo*	*E. Mts.*	*Migiurtina*	*Sol Haud*	*Nogal Valley*	*Haud*	*Ogaden*	*Obbia*	*Shebeli & Juba*	*Lake Rudolf*	Approximate distribution elsewhere
III.—Continued.																
Lygodactylus somalicus									√	√	√	?	√	√		
Pristurus phillipsi						√	√	√	√		√	?	√	√		
P. crucifer		√	√	√	√	√	√	√	√	√	√	√	√	√		
P. flavipunctatus	√	√	√	√	√	√	√	√	√	√	√	√	√	√		
Tropiocolotes somalicus					√											
Agama robecchii							√	√					√			
A. phillipsi		√	√			√										
A. annectans		√	√			√	√	?	√							
A. rueppelli rueppelli						√	√	√	√	√	√	√	√	√		
A. rueppelli occidentalis															√	
A. rueppelli septentrionalis																Central and S. Kenya
A. persimilis											√					
A. battillifera						√	√	√				?				
A. taylori											√					
Uromastix princeps							√	√	√		√					
U. macfadyeni					√											
Ancylocranium somalicum											√			√		

TABLE III, (*Continued*)

	A. E. Sudan	*Eritrea*	*Ethiopia I*	*S. Arabia*	*Guban*	*Mts. of Ogo*	*E. Mts.*	*Migiurtina*	*Sol Haud*	*Nogal Valley*	*Haud*	*Ogaden*	*Obbia*	*Shebeli & Juba*	*Lake Rudolf*	Approximate distribution elsewhere.
III — Continued																
Eremias smithi					√	√					√	√	√			
E. septemstriata									√	√	√					
E. brenneri		?				√						√	√	√		
E. striata											√	?	√	√		N. Kenya
Latastia carinata			√		√									√		
L. boscai boscai		√	√		√	√										
L. boscai burii						√	√			√						
L. boscai arenicola											√	√	√			
L. taylori							√		√							
Philochortus spinalis		√	√		√											
P. intermedius intermedius					√	√					?			√		
P. intermedius subsp.											√					
P. intermedius rudolfensis															√	
P. phillipsi						√	√	√	√	√	√					
P. hardeggeri					√	√					√					
Riopa laeviceps											√	√		√		
R. vinciguerrae										√	√	√	√	√		

often it is not sufficiently marked for the race to receive taxonomic recognition.

There can thus be recognised four faunal divisions and the following is a summary of the composition of their lizard-faunae as far as at present known.

A. *The Guban* with 26 species and subspecies of which 2 are confined to this zone. Of the remainder, 12 are Eremian forms and 11 Somali endemics; 19 of the forms are also found in the Ogo, 11 penetrate to the Haud zone and 6 to the Eastern Mountains.

B. *The Western Mountains and Ogo* which, though no greater in area than the Guban, has 44 species and subspecies, 4 of which are not known to occur elsewhere; only 8 are Eremian forms, and 21 are Somali endemics; 19 of the forms penetrate into the Guban, 15 into the Eastern Mountains and 20 into the Haud.

C. *The Eastern Mountains*, the smallest and probably least collected area, has only 19 recorded species and races, of which none are confined to the area; three are Eremian forms, and 12 Somali endemics. Fifteen of the forms are common to the western Mountains, 6 to the Guban and 15 to the Haud.

D. *The Haud*, including the Sol Haud, Daror and Nogal Valleys and the Ogaden, is the largest area and has also the largest fauna. There are 52 recorded species and subspecies, 8 of which are not known to occur elsewhere; only 2 of the Eremian species penetrate into this zone and 36 of the forms are Somali endemics; 26 of the forms occur also in the Western Mountains and Ogo, 15 in the Eastern Mountains, but only 12 in the Guban. The fact that only 23 per cent of the lizards of the Haud are found in the Guban, 60 miles or less distant, indicate how very effective the mountain and climatic barriers are to the dispersal of animals of this group.

The almost complete absence of endemic genera in an area which otherwise shows such very pronounced endemism supports the geological evidence that this is a relatively new country; the endemism itself emphasises the effectiveness of the geographical and climatic barriers in imposing isolation. The distinctiveness of the fauna of the Guban points clearly to a very close linkage between the lizard fauna and the ecological conditions. The fact that 77 per cent of the species of the Haud, with a mean annual rainfall less than 20 inches, have been unable to colonise the dry Guban, and, conversely, that more than half of the forms found in the latter area have failed to penetrate into the Haud, makes it seem highly improbable that any of these animals could have tolerated the vastly different, wet condi-

tions of Gamblian times. As we have seen, migration into the area from both the north-west and the south has taken place, but the number

Fig. 3. Distribution of the Subspecies of *Latastia longicaudata*. Areas over 1500 metres stippled; over 2000 metres hatched.

° *Latastia longicaudata longicaudata* an Eremian subspecies ranging from Nigeria to Sinai.

● *L.l. revoili* ranging southwards into Tanganyika Territory; also reported from Eritrea.

+ *L.l. caeruleopunctata*

* *L.l. doriai*

† *L.l. andersoni*

of colonists which still exist in the countries to the north-west, where desiccation has progressed even further than in Somaliland, is small.

If, as seems probable, the process of desiccation has spread from the north, immigrants from the dry territories will also have spread south-

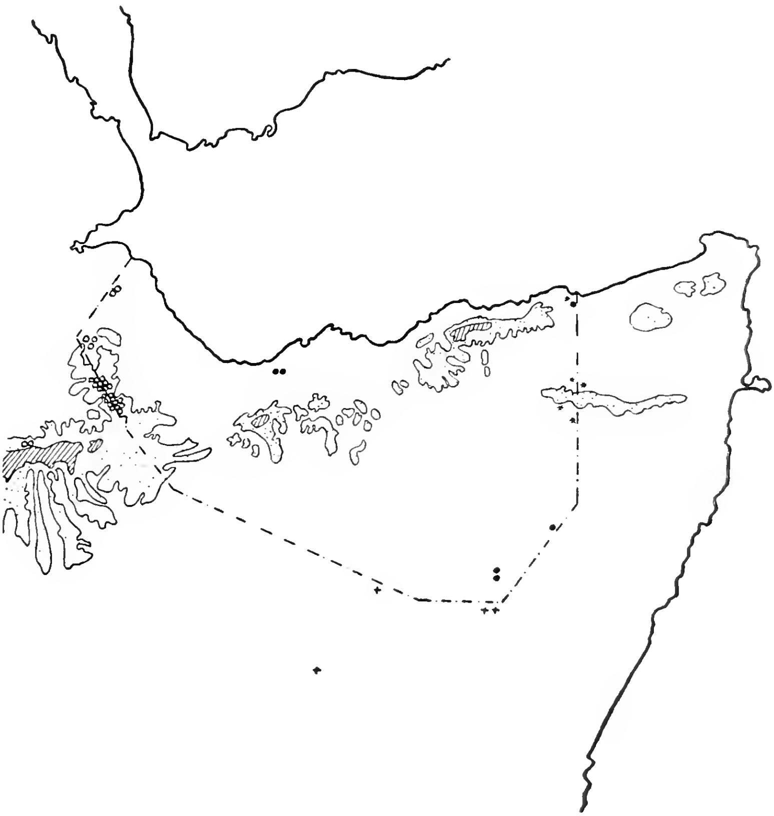

Fig. 4. Distribution of the Subspecies of *Latastia boscai* and *L. taylori*. Highlands as in Fig. 3.

° *L. boscai boscai*, a subspecies of the mountains of Ethiopia and Eritrea.

● *L.b. burii*

+ *L.b. arenicola*

* *L. taylori*

wards, to be replaced in the north by a succession of new immigrants better able to live under the progressively more arid conditions develop-

ing there. This would account for the large numbers of Lacertidae, a predominantly Palaearctic family, and for such forms as the Eublepharid geckoes (*Hemitheconyx*) and the genus *Teratolepis*, both of which have discontinuous Eremian distributions. But there is also a strong Ethiopian element in the fauna and, once again, the amount of subspecific and specific differentiation which exists between the Somali forms and their relatives in the damper countries to the south emphasises the close connection between climatic conditions and faunal change.

In the following systematic section will be found synoptic keys to all the species which have been recorded from British Somaliland. Many of these are modified from tentative keys which Capt. Taylor utilised in the field, and so have been subjected to some testing. There are also notes on the taxonomy of some of the species and references to the original description, and to other names which have been used in reference to the same species in the Somaliland Peninsula. Notes on habits and habitats which have been incorporated are all based upon the excellent field notes provided by Capt. Taylor, and the specimens listed are those obtained by him during his journey along the southern and western boundaries. Occasionally, when revisionary work has embraced a wider field and led to a new and different opinion concerning the status of the forms involved, it has been found necessary to include keys to, and descriptions of, species which do not occur in north-east Africa. The bibliography given is probably far from complete, but it is hoped that it contains references to all the more important papers dealing with the lizards of British Somaliland.

Needless to say this paper could never have been written without the generous co-operation of a number of people, especially of Captain Taylor; acknowledgement of the author's gratitude to him is tendered herewith; also to Dr Thomas Barbour for having it published by the Museum of Comparative Zoölogy, as well as to Mr. Arthur Loveridge and Dr. A. F. Carr, Jr. for seeing it through the press, Dr. Guiseppe Scortecci, Dr. W. A. Macfadyen, Dr. V. E. Fuchs and M. F. Angel, who have all rendered help by correspondence and the loan of valuable material, and to Col. M. Simon for the figure of a vertebra of *Brookesia superciliaris*.

GECKONIDAE

*Hemidactylus**

I. Unregenerated tail depressed, root-shaped, marked off by a basal constriction, and usually shorter than the head and body.

A. Back with rows of very large, trihedral, strongly-keeled tubercles; regenerated tail leaf-shaped.

1. 8-9 lamellae beneath the inner, and 10-12 beneath the fourth toe; 8 preanal, but no femoral pores .... *H. taylori* Parker
2. 4-6 lamellae beneath the inner, and 6-7 beneath the fourth toe; a long series (28-36) of femoral and preanal pores .... *H. ruspolii* Boul.

B. Back with rows of moderately large, smooth or slightly keeled tubercles; regenerated tail tapering.

4 lamellae beneath the inner, and 6-7 beneath the fourth toe; 12-18 femoral and preanal pores .... *H. laticaudatus* Andersson

C. Back with uniform or nearly uniform dorsal scales.

1. Dorsal scales granular; 7-9 lamellae beneath the inner, and 12-13 beneath the fourth toe; 5-6 femoral pores on each side; no preanal pores .... *H. flaviviridis* Rüppel
2. Dorsal scales sub-imbricate; 5 lamellae beneath the inner, and 8-9 beneath the fourth toe; no femoral pores; 4 preanal pores.. .... *H. curlei* sp. nov.

II. Unregenerated tail conical, longer than the head and body, and without any basal constriction.

A. Back with rows of strongly enlarged and usually more or less strongly keeled tubercles, often trihedral.

1. Free distal joints of the digits moderately long, the claw extending well beyond the basal dilatation.
    a. Tail strongly depressed, the outermost row of tubercles forming a sharp ventro-lateral edge proximally.......... .... *H. barodanus* Boul.
    b. Tail but slightly depressed, without ventro-lateral crest.
        i. A long series of femoro-preanal pores (20-40); 4-6 lamellae beneath the inner, and 7-8 under the fourth toe................................ *H. brookii* Gray
        ii. A series of preanal (2-12), but no femoral pores.

*Written prior to the trinomial treatment of certain of these species in Copeia, 1941, pp.245–248, which the author, being engaged in war work, has not had the opportunity of seeing.

- * Digits strongly dilated basally; 6-9 lamellae under the inner, and 9-12 under the fourth toe; preanal pores 6-12; adult size 54-80 mm. . . . . *H. macropholis* Boul.
- ** Digits strongly dilated basally (fig. 6); 5-8 lamellae under the inner, and 8-11 under the fourth toe; preanal pores 6-8; adult size 40-59 mm. . . . . *H. turcicus* Linn.
- *** Digits very feebly dilated basally (fig. 5); 5-8 lamellae under the inner, and 8-11 under the fourth toe; preanal pores 2-6; adult size 40-59 mm. . . . . *H. sinaitus* Boul.

2. Free distal joints of the digits short, the claw scarcely extending beyond the basal dilatation; 4-5 lamellae under the inner and 6-7 under the outer toe; preanal pores 4-7; adult size 26-36 mm. . . . . *H. citernii* Boul.

B. Back with uniform granules, or with small conical or scarcely keeled tubercles.

1. Back and base of tail with definite enlarged scales or tubercles.
   - a. Basal ¼ of toes granular like the sole of the foot; tubercles extending forward on to the occiput and neck; 5-7 lamellae under the outer, and 6-8 under the fourth toe; femoro-preanal pores 30-60. . . . . *H. mabouia* Mor. de Jonn.
   - b. Subdigital lamellae extending on to the sole of the foot.
     - i. Dorsal tubercles extending forwards on to the occiput and neck; 8-9 lamellae beneath the outer, and 9-11 under the fourth toe.
       - * Femoro-preanal pores 28-32; adult males up to 53 mm. from snout to vent; dorsal tubercles conical. . . . . *H. smithi* Boul.
       - ** Preanal pores 8; no femoral pores; adult males *circa* 70 mm.; dorsal tubercles flattened . . . . *H. jubensis* Boul.
     - ii. Dorsal tubercles not extending on to the head and neck; femoral pores 24-28. . . . . *H. frenatus* D. & B.
2. Back with uniformly small granular scales, or with a few very indistinct, slightly enlarged ones.

a. Distance from the tip of the snout to the anterior border of the bony orbit a little longer than the distance between eye and ear; eye distinctly shorter than its distance from the nostril; claw extending well beyond the lamellar portion of the digits.

  i. Ventrals large, about 7 longitudinal series at mid-body corresponding to a distance equal to the diameter of the eye; subdigital lamellae abruptly differentiated from the granules of the sole. . . . . *H. laevis* Boul.

  ii. Ventrals small, 12-16 longitudinal series at mid-body, corresponding to a distance equal to the diameter of the eye; subdigital lamellae very small proximally, scarcely larger than the granules on the sole, 5-6 beneath the inner, and 9-11 beneath the fourth toe; no femoral or preanal pores. . . . . *H. somalicus* Parker

b. Distance from the tip of the snout to the anterior border of the bony orbit as long as the distance between eye and ear; eye as long as its distance from the nostril; claw only just extending beyond the basal lamellae, of which there are 5 under the inner, and 8-9 beneath the fourth toe; preanal pores 2. . . . . *H. megalops* Parker

1. Hemidactylus taylori Parker

H. taylori Parker, 1932, Proc. Zool. Soc. London, p. 342.

This species has only been found in the Sol Haud, 9°10′N x 49°E and 9°35′N x 49°E; it is, apparently terrestrial, and probably nocturnal.

2. Hemidactylus ruspolii Boulenger

H. ruspolii Boulenger, 1896, Ann. Mus. Civ. Genova, (2), 4, p. 3, pl. i, fig. 1.

4 ♂ ♂, 4 ♀ ♀, juv.	Haud, 2100 ft.	46°20′E x 8°15′N
2 ♀ ♀	Haud, 3050 ft.	45°09′E x 8°37′N
♂	Haud, 3100 ft.	45°04′E x 8°39′N
4 ♂ ♂, 4 ♀ ♀	Ado, 2100 ft., Ogaden.	

This very conspicuously marked black and yellow gecko appears to be confined to the eastern parts of the Haud in British Somaliland (east of the 45th meridian), but extends southwards through the Ogaden and Italian Somaliland to northern Kenya Colony and the Lake Rudolf basin. It is chiefly arboreal, being usually found beneath

the bark of dead trees, though Scortecci (1931, p. 127) records one as having been collected in the walls of an old building.

3. Hemidactylus laticaudatus Andersson

H. laticaudatus Andersson, 1910, Jahrb. Nassau. Ver. Nat., **63**, p. 200.

Known from a single specimen collected at Harrar, this gecko may perhaps be found in the mountains of the Ogo.

4. Hemidactylus flaviviridis Rüppel

H. flaviviridis Rüppel, 1835, N. Wirbelthiere Fauna Abess., p. 18, Pl. vi, fig. 2.

Though originally described from Massaua, this is in reality an oriental gecko, which appears to have been introduced along the Red Sea littoral in the neighbourhood of the ports.

5. Hemidactylus curlei spec. nov.

Holotype a ♀, number 1937.12.5.295 in the British Museum, from the Borama District (43°10′E. x 9°55′N), 5000 feet, collected among stones and rocks on Dec. 2nd, 1932.

Habitus very depressed; head broad and flat, its maximum width much greater than the distance between the tip of the snout and the posterior border of the eye. Nostril pierced between the rostral, first upper labial and 3 nasals, of which the upper is separated from its fellow by a single scale. Rostral much broader than deep, with a median cleft. Snout flat, covered with rounded juxtaposed granules, which are much larger than those on the very flat occiput; eight upper, and six or seven lower labials; mental triangular, nearly as long as broad; median chin-shields very large, forming a long median suture; a much smaller second pair of chin shields is followed by some enlarged scales bordering the lower labials. Ear opening small, oblique, its distance from the eye equal to the distance between nostril and eye. Body depressed, with a slight, median dorsal furrow, covered above with somewhat irregular, flat, subcircular, sub-imbricate scales and below with cycloid imbricate scales which are nearly twice as large as the dorsals; the latter are not absolutely uniform in size, but there is no trace of any definitely enlarged scales or tubercles; about 87 dorsals and ventrals in a series round the middle of the body. Tail strongly depressed, with a median furrow, root-shaped and with a distinct basal constriction; it is covered above with imbricating scales arranged in

transverse rows and is indefinitely annulate, 5 rows of dorsal scales forming an annulus; beneath there is a series of transversely enlarged subcaudals of which two occur on each annulus; the tip of the tail is regenerated, and this portion is not annulate, but covered above with quincuncially arranged imbricate scales and has transversely enlarged subcaudals. Limbs short, the adpressed hindlimb reaching the wrist. Digits well dilated basally and with moderately long terminal phalanges which extend well beyond the lamellar portion; lamellae extending on to the palms and soles, 5 under the inner, 8 under the fourth, and 7 or 8 beneath the fifth toe.

Yellowish above, heavily blotched and spotted with purplish black. A dark streak from the nostril through the eye and above the ear to the sides of the neck from whence it is continued as a row of spots to the base of the tail; flanks with an indefinite row of spots, and mid-dorsal area with series of rather irregular transverse blotches; tail with alternately darker and lighter cross-bars; limbs and flanks with scattered, circular, white spots. Lower surface white.

Length from snout to vent 43 mm.
Tail (posterior third regenerated) 42 mm.
Fore-limb 13 mm.
Hind-limb 14 mm.

Paratypes a male and 3 females from the type locality, collected 26.XI.32, a male collected between the type locality and Hargeisa (4100 ft., 44°E x 9°35′N) in October 1932, and a male and female from 43°E x 10°05′N, 16.IX.33.

These specimens were all collected amongst stones and rocks and agree in essentials with the holotype. The number of upper labials varies from 8 to 10, of lower labials from 6 to 8, of scales round the body from 81 to 93, and of subdigital lamellae beneath the fourth and fifth toes from 8 to 9 and 7 to 9 respectively. Males have 4 preanal pores. The colour is similar to that of the type, but the markings are usually quite irregular. No specimen has a completely unregenerated tail, but the fully regenerated appendage is similar in shape to the unregenerated, but without annuli and without transverse scale-rows.

The species resembles the Sokotran *H. homoeolepis* Boulenger in its flat, subimbricate scales, a character in which it approaches the genus *Teratolepis*. But it differs from both *homoeolepis* and its ally *laevis* in its much more depressed habitus and the root-shaped tail. No species with this type of caudal appendage has such uniform flat scales or so few subdigital lamellae; the species which it approaches most nearly is *H. zolii* Scortecci.

6. Hemidactylus barodanus Boulenger

H. barodanus Boulenger, 1901, Proc. Zool. Soc. London, p. 48, pl. vii, fig. 2.

4 ♂♂, 7 ♀♀ & 2 juveniles from the Borama district (9°55′-10° 20′ N x 42°25′-43°15′E) at altitudes of from 4000-6000 feet.

Previously this gecko was known from but a single specimen collected at Gan Lebar (= Gaan Libah) in the mountains S.S.W. of Berbera; in addition to the foregoing series from the mountains of the Ogo it has now also been found in the mountains of western Ethiopia.

The Ogo series shows a range of variation in the size and strength of keel of the dorsal tubercles which is quite comparable with that noticed in *H. turcicus* (q.v.). In some individuals the tubercles are large and trihedral, as in *H. macropholis* but in others they are less than half this size and only feebly keeled. These latter agree with the unique type of *barodanus*. Hitherto the shape of the tail has not been definitely known, but owing to the fact that the basal portion of it, which is the only part existing in the type, is strongly depressed, the author (1932, p. 346) placed the species amongst those in which this organ is root-shaped and constricted basally. This is not the case, however, for the complete tail has no such constriction and is slightly longer than the head and body. It is strongly depressed, its depth being about half its breadth, and the outermost row of tubercles forms a sharp ventrolateral edge in the proximal part. This character distinguishes the species readily from both *turcicus* and *macropholis* which it resembles in the number of subdigital lamellae (6-8 under the inner, 9-11 under the fourth and 10-12 under the fifth toe), femoral pores (6-11) and tubercles; in both the tail is nearly circular in section and the outermost row of tubercles is not, or scarcely, ventral to the lateral midline.

The largest male and female each measures 70 mm. from snout to vent.

All the specimens were collected in, or under, stones and rocks.

7. Hemidactylus brookii Gray

H. brookii Gray, 1845, Cat. Lizards Brit. Mus., p. 153.

It seems peculiar that this common house gecko, wide-spread through the Sudanese and northern Savannah provinces of Africa and in the Indo-Malayan region should not have been discovered in British Somaliland. It has been reported from the Harrar region of Ethiopia (Jaldessa) and from Italian Somaliland (Lugh).

8. Hemidactylus macropholis Boulenger

H. macropholis Boulenger, 1896, Ann. Mus. Genova, (2), **17**, p. 3, pl. i, fig. 2.

9 ♂ ♂, 6 ♀ ♀, 5 juvs. Haud, 2100–4000 ft., between 44°15′ — 46°20′E x 8°15′ — 8°55′N.
juv. ♂ Ado, 2100 ft., Ogaden.

Originally described from Dolo, Italian Somaliland, this species has since been recorded from other localities in that colony, from northern Kenya (Merelle River) and from the eastern districts of British Somaliland, east of the 44th meridian. It may ultimately prove to be a geographic race of *turcicus* which, in British Somaliland appears to be confined to the coastal zone of the north-west and the adjacent mountains of the Ogo. *H. turcicus* has, however, been recorded from Italian Somaliland (Scortecci, 1929, 1931; Calabresi, 1927) within the known range of *macropholis* and further collecting alone can decide whether or not the two intergrade. All the specimens were taken in dead trees or in termites' nests.

9. Hemidactylus species

♀, juv. Guban, 1500 ft. 43°E x 11°N.

These two specimens represent a species similar to *macropholis*, but differing in the possession of an even larger number of subdigital lamellae (10 under the inner, and 14 beneath the fourth toe), in having larger, more numerous dorsal tubercles, smaller ventrals, and a very distinctive colour pattern of broad, dark, transverse bars. In many characters, and especially in their colour, they resemble the Indian *H. triedrus* and *H. subtriedrus*, but do not appear to be referable to any described species. In the absence of a male, however, it is not possible to give an adequate description or to assess fully the relationships of the animal; so that, until further specimens are obtained, it must remain nameless. It appears to frequent dry, stony ground in a region completely devoid of vegetation.

10. Hemidactylus turcicus (Linn.)

Lacerta turcica Linn., 1758, Syst. Nat. (10), p. 202.
? *Hemidactylus puccionii* Calabresi, 1927, Atti Soc. Ital. Sci. Nat., **76**, p. 23, pl. i, fig. 3.

♂, Berbera
11 ♂ ♂, 8 ♀ ♀ 42°50′ — 43°15′E, 9°55′ — 11°25′N, 150–4500 ft.
2 ♂ ♂, 4 ♀ ♀ Island off the coast at Zeilah.

The species was not found along the southern and eastern boundaries of British Somaliland, but appears to be confined to the north-western corner of the territory and to the coastal zone. With the exception of the specimen taken at Berbera, which was found in a bungalow, all the specimens were found among rocks or stones or hiding under dead logs.

The series shows a great deal of variation in the size of the dorsal tubercles and the extent to which they are keeled. In a series of 8 specimens from 43°15′ x 11°25′N, there is every variation between examples with relatively large, regularly arranged, strongly keeled tubercles, and one specimen in which the tubercles are only about half as large and are but feebly keeled; among 7 others from 42°50′E x 10°10′N most show the latter condition and two have the tubercles so small as to be scarcely perceptible and with barely a trace of a keel to be discerned. These recall, very strongly, the described condition of *Hemidactylus puccionii* Calabresi, from Italian Somaliland, and it is probable that this name is based on a small, smooth-tuberculate specimen of *H. turcicus*. No such individuals occur in the northern (Mediterranean) part of the range of *turcicus*, but in Somaliland they appear to form a considerable percentage of the total population and their occurrence may be taken to indicate the beginnings of racial differentiation, though this does not appear to be sufficiently well-marked to justify the use of trinomials.

11. Hemidactylus sinaitus Boulenger

H. sinaitus Boulenger, 1885, Cat. Lizards Brit. Mus., **1**, p. 126.

♂ 43°15′E x 10°30′N, 3000 ft. 18.iv.33.
juv. ♂ 43°15′E x 11°25′N, 150 ft. 9.i.34.

Anderson (1898, p. 83) showed that the characters originally used to distinguish *H. sinaitus* from *H. turcicus* were untenable when a large series was examined. He accordingly considered *H. sinaitus* to be a "variety" of *turcicus* and more recent authors have used the name *sinaitus* in a subspecific sense. But this practice does not seem to reflect the true relationships between the two, for the geographical range of *sinaitus* falls within that of *turcicus*. The above mentioned two specimens differ considerably from a series of *turcicus* (q.v.) found in the same region at the same time, notably in the degree of dilatation of the basal portion of the digits, and the length of the claw. They agree well with the type of *sinaitus* and, unless it can be shown that the digits of *turcicus* may vary enormously, it seems more reasonable to regard the two as distinct species. The accompanying figures, (5

and 6) one of the type of *sinaïtus* and the other of a specimen of *turcicus* of comparable size, but selected on account of the unusually small

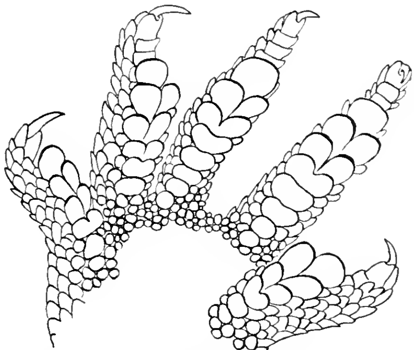

Fig. 5. *Hemidactylus sinaitus.* Left foot of Holotype.

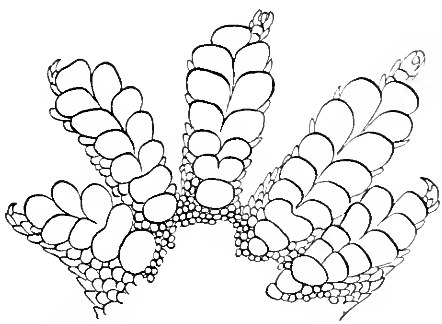

Fig. 6. *Hemidactylus turcicus.* Left foot of a female of a size comparable with the above.

number of its lamellae, reveal the differences better than any description. There are also certain other minor differences, thus:

H. turcicus	*H. sinaitus*
a. Digits strongly dilated basally	a. Digital dilatations small
b. Claw short and stout	b. Claw long and slender
c. Lamellae on the hallux 6-8, usually 7.	c. Lamellae on the hallux 5-8, usually 5.
d. Supranasals usually separated	d. Supranasals in contact
e. Scales on the snout small	e. Scales on the snout larger
f. Preanal pores 6-8	f. Preanal pores 2-6

Both the present examples were found among stones.

12. Hemidactylus citernii Boulenger

H. citernii Boulenger 1912, Ann. Mus. Genova, (3), **5**, p. 329.

♂, 2 ♀ ♀ 43°15′E x 11°25′N, 150 ft.

The discovery of this species in the extreme north-west of British Somaliland is surprising. Hitherto it has only been reported from the Upper Juba province of Italian Somaliland (Rahanuin Country) and the eastern boundary of the British territory. The north-western specimens are, however, quite typical, and it may be that the species has a continuous range around the coastal zone; it must be either very rare in, or completely absent from, the Haud and the mountains of the Ogo.

13. Hemidactylus mabouia (Mor. de Jonnés)

Gecko mabouia Moreau de Jonnés, 1818, Bull. Soc. Philom., p. 138.

This cosmopolitan gecko, common throughout the Savannah provinces of Africa, is apparently rare in British Somaliland. It has been recorded at "Lasgore" (=Las Khoreh) by Vaillant, and Scortecci (1931) mentions two individuals collected close to the Anglo-Italian boundary at El Donfar and Gardo; strangely enough it was not found by Capt. Taylor in this region. It seems very probable that humidity may be the limiting factor in the distribution of the species, its place being taken in the dry areas of the Eremian region and Somaliland by *H. turcicus*.

14. Hemidactylus smithi Boulenger

H. smithi Boulenger, 1895, Proc. Zool. Soc. London, p. 532, pl. xxix, fig. 2.

4 ♂ ♂, 6 ♀ ♀ Haud, 2100–2800 ft., 45°24′–46°25′E x 8°15′–8°32′N.

An arboreal gecko of the eastern and central Haud, Nogal Valley and Buran districts extending southwards to the Webi Shebeli (type locality). The largest specimen of the present series, a female, measures 57 mm. from snout to vent.

15. Hemidactylus jubensis Boulenger

H. jubensis Boulenger, 1895, Ann. Mus. Genova, (2), **15**, p. 10, pl. iii, fig. 1.

The record of this species from the Golis Mountains (Boulenger 1895b) appears to be based on a small-tubercled *H. turcicus* similar to those mentioned above. True *jubensis* is known only from the Ganale Doria, Milmil and Biornal, but since so many species with a similar distribution range into the Haud, its presence there may be expected.

16. Hemidactylus frenatus Dum. & Bib.

H. frenatus Duméril & Bibron, 1836, Erpet. Gén., **3**, p. 366.

An oriental species which appears to have been introduced into the south of Italian Somaliland (Lower Shebeli province); it may also be found in British territory.

17. Hemidactylus laevis Boulenger

H. laevis Boulenger, 1901, Proc. Zool. London, p. 48, pl. vii, fig. 1.

Originally found at "Ganlebar" (=Gaan Libah) in the Golis mountains this species has not been rediscovered in the British territories but has been reported from the south of Italian Somaliland (Dolo and the Rahanuin Country, Boulenger, 1912). If these latter two records are correct the species must have a considerable range and may be expected in very different types of country. But a mis-identification is to be suspected, and it seems highly probable that there has been a confusion with *H. fragilis* Calabresi, a closely similar species described from Bur Melde in the same general region.

18. Hemidactylus somalicus Parker

H. somalicus Parker, 1932, Proc. Zool. Soc. London, p. 344.

A species closely allied to the preceding but known only from the Sol Haud, Nogal Valley and eastern Haud. Nocturnal and terrestrial.

19. Hemidactylus megalops Parker

H. megalops Parker, 1932, Proc. Zool. Soc. London, p. 345.

Another little known species of the Sol Haud and Nogal Valley.

Teratolepis Günther 1869

Teratolepis Günther, 1869, Proc. Zool. Soc. London, p. 504 (type species *Homonota fasciata* Blyth).

Bunocnemis Günther, 1894, Proc. Zool. Soc. London, p. 85 (type species *Bunocnemis modestus* Günther).

Lophopholis Smith & Deraniyagala, 1934, Ceylon Journ. Sci., B, **18**, p. 235 (type species *Teratolepis scabriceps* Annandale).

In north-east Africa there are known a few geckoes usually referred to the genus *Hemidactylus*, in which the dorsal scales are strongly im-

bricate. In this character they differ from all other members of the genus, and, in addition, they all have rather feebly dilated digits, though in this respect there is complete intergradation with the condition of normal *Hemidactylus*, through species such as *fragilis* Calabresi, *somalicus* Parker and *megalops* Parker. But there are also in the same zoo-geographical region two other geckoes in which the scales are imbricate and in which the digital lamellae are smaller still, and are, for the most part, undivided mesially; these have been referred to a distinct genus, *Bunocnemis*. But a new species in the present collection, described below as *taylori*, completely bridges the gap between *Bunocnemis* and the imbricate-scaled species of *Hemidactylus*. It is very closely allied to the type species of *Bunocnemis*, even to possessing enlarged scales on the back of the legs, but the digital lamellae are almost all divided and thus exhibit the same condition as is found in species like *ophiolepis* and *isolepis*. It might accordingly be considered advisable to unite *Bunocnemis* with *Hemidactylus*, or alternatively, to refer the imbricate-scaled species of *Hemidactylus* to *Bunocnemis*. But reference to the geckoes in other areas reveal the fact that similar species have received different generic names. Thus the Oriental *Teratolepis* differs from *Hemidactylus* in its imbricate scales, and undivided subdigital lamellae, and so is exactly comparable, and cannot be distinguished from a *Bunocnemis* whilst *Lophopholis* is simply an Oriental imbricate-scaled *Hemidactylus*. It thus becomes necessary to reconsider the status of these different genera. At first sight it might seem advisable to merge them all into *Hemidactylus*, for there is nowhere any hard and fast line whereby any one or all of them can be easily cut off. But the combination of imbricate scales and somewhat less highly developed digital pads suggests that we are, in fact, dealing with a natural group of primitive species, and it may perhaps be significant that the distribution of these primitive forms—West Africa, Somaliland, India—is somewhat similar to that of the primitive "Eublepharid" geckoes of the Old World.

The oldest group-name available for these imbricate-scaled species is *Teratolepis* and the various species may be distinguished thus:

I. Tail root-shaped; dorsal scales obtusely keeled; digital lamellae undivided; preanal pores 6. . . . . *T. fasciata* Blyth

II. Tail conical, tapering.

A. Dorsal scales quite smooth.

1. Hinder side of thighs with enlarged tubercles; scales about the middle of the body 76-83 in ♂♂, 96-102 in ♀♀.

a. Occiput and nape with numerous enlarged, flat scales, two or three times as large as the granules between them[1]; subdigital lamellae undivided........... *T. matschei* Tornier

b. Occipital scales small, homogeneous.

† Colouration uniform brown; subdigital lamellae for the most part undivided............. *T. modesta* Günther

†† A marked colour pattern of vertebral light spots and a labial stripe; subdigital lamellae almost all completely divided......................... *T. taylori* sp. nov.

2. Hinder side of thighs without enlarged tubercles.

a. Scales about the middle of the body 50-58; preanal pores 8-22.......................... *T. ophiolepis* Boulenger

b. Scales about the middle of the body 62-65 in ♂♂, 67-77 in ♀♀; preanal pores 6-8.......... *T. isolepis* Boulenger

B. Dorsal scales keeled or striated; subdigital lamellae divided.

1. Dorsal scales uniform, striated; scales at midbody 55 in ♂, 55-62 in ♀♀; preanal pores 6........ *T. scabriceps* Annandale

2. Dorsal scales heterogeneous, strongly keeled.

a. Enlarged scales feebly keeled, widely separated from one another; preanal pores 13-19......... *T. squamulatus* Tornier

b. Enlarged scales strongly keeled, larger than the interspaces between themselves; preanal pores 6-10........... .... *T. tropidolepis* Mocquard

The only species of the genus found in British Somaliland are as follows:

1. Teratolepis taylori spec. nov.

Holotype a ♂, number 1937.12.5.305, in the British Museum, collected in the Haud (2100 ft., 46°20′E x 8°15′N) by Capt. R. H. R. Taylor on Jan. 26th, 1932.

Head once and a half as long as broad, somewhat depressed; snout longer than the distance from the eye to the ear, which is small and subcircular. Scales of the snout juxtaposed, large and polygonal; rostral quadrangular, with a median cleft; nostril pierced between the rostral, first upper labial and three nasals, of which the uppermost forms a suture with its fellow; seven or eight upper and six lower labials; mental large, pentagonal, followed by two large pairs of chin shields, of which the anterior pair form a long median suture; remainder of the

[1] No typical material has been examined, but the character is found in a specimen from Zaria Province, N. Nigeria.

lower labials bordered by some enlarged scales. Scales of occiput and nape homogeneous, granular; dorsals smooth, a little larger than the ventrals; about 78 scales around the middle of the body. Limbs short, overlapping when adpressed. Digits short, very slightly dilated proximally and with divided lamellae, which grade insensibly into the granular scales of the palms and soles. The numbers under the digits[1] are: fingers 5, 6, 7, 7, 7, and toes 6, 7, 8, 8, 6, counting from the first to the fifth respectively. Distal phalanges of the fingers very short, but those of the toes very much longer and armed with very long, slender claws. Posterior surfaces of femora and tibiae with some enlarged, irregularly arranged tubercles. Tail conical, with smooth scales similar to those of the body. An angular series of 15 preanal pores and a single conical tubercle on each side of the base of the tail; post-anal bones and sacs present.

Brownish grey above; a light line along the upper lip continuing to the region above the arm. This light stripe is bordered above by a blackish stripe from the nostril, through the eye and above the ear, and beneath by an interrupted black line along the lower labials and backward as a series of small, widely spaced dots to the arm. A short whitish stripe from the eye along the temple; a V-shaped transverse bar on the occiput, followed by a series of six distinct, round or transversely oval, white spots along the vertebral line; tail with a median series of transversely oval spots anteriorly which give place to two alternating dorso-lateral series behind. Hinder side of the hind-limbs with circular white spots. Lower surfaces uniform white.

Length from snout to vent	46 mm.
Tail (reproduced terminally)	42 mm.
Fore-limb	11 mm.
Hind-limb	14 mm.

Paratypes:

A male with the same data as the holotype.

A female collected in the Haud (2700 ft., 45°29′E x 8°30′N) 4. VI.32.

A male collected in the Haud (3300 ft., 44°54′E x 8°42′N) 23. VII.32.

A female collected in the Haud (3800 ft., 44°24′E x 8°52′N) 11.IX.32

This short series shows some variation though the general features of pholidosis and proportions are similar. The number of scales about the body varies from 76 to 80 in males and from 96 to 102 in females. The relative sizes of the chin-shields and their shape varies, but the anterior pair always form a long median suture; upper labials vary from

[1]These figures can only be given as approximations, since the proximal lamellae cannot be determined.

7 to 8 and lower labials from 6 to 7; femoral pores may be from 12 to 19; subdigital lamellae on the fingers and toes: Fingers I 4-5, II 6-7, III 7-8, IV 7, V 6-7; toes I 5-6, II 6-7, III 6-8, IV 6-8, V 5-6. The colour pattern is always similar to that of the type, the white labial stripe and its dark upper border being very constant. The temporal white mark is often indistinct and the vertebral white spots are usually transversely dilated and vary in number from 5 to 7. The dorsum may also have indefinite darker marks which may form a vertebral line between the white spots.

The species inhabits sandy country with scrub and patches of grass. All, except one of the specimens, were found on the ground in grass, the exception being discovered beneath a stone.

The nearest relative of this species is undoubtedly *T. modestus* from which it may be distinguished by the smaller size of the post-femoral tubercles, the divided sub-digital lamellae and the very distinctive colour-pattern. *T. modestus* is classed by Loveridge (1937, p. 492) as an inhabitant of the "wet and humid coastal plain", where it is found in piles of rubbish and rotting vegetation.

2. Teratolepis ophiolepis Boulenger

Hemidactylus ophiolepis Boulenger, 1903, Ann. Mag. Nat. Hist. (7), **11**, p. 55.

♂, ♀ Haud, 2900 ft. 45°15′E x 8°34′N
juv. ♂ Borama District, 4500 ft. 43°10′E x 9°55′N

These three specimens agree closely with the type and hitherto only known example of this species, except in the number of femoral pores. In the type there are 8 only, but in both the above-mentioned males there are 22. This is a greater range of variation than would have been expected, but, in the absence of any other distinguishing feature cannot be taken to indicate specific difference.

It appears to be a montane form, ranging from the Hawash River to the Mountains of the Ogo and the western Haud; the two examples from this latter region were found in a termite nest.

3. Teratolepis isolepis Boulenger

? *Hemidactylus homoeolepis* (non Boulenger) Boettger, 1893, Zool. Anz. 426–417, p. 114.

Hemidactylus isolepis Boulenger, 1895, Proc. Zool. Soc. London, p. 531, pl. xxix fig. 1.

♂ Borama District, 5000 ft., 43°10′E x 9°55′N
♂, ♀ Borama District, 5300 ft., 43°15′E x 9°50′N

These examples show little variation beyond that recorded for the species in the Lake Rudolf region (Parker, 1932a, p. 223). In the two males the number of scales about the middle of the body is 59 or 60 and in the female about 81, rather irregularly disposed; the femoral pores are six and the number of subdigital lamellae slightly smaller.

In British Somaliland the species appears to be a montane form, only having been reported at Gaan Libah (5900 ft.) in addition to the foregoing records from the Borama District. It has also been recorded from the mountainous Harar region, but in the south it extends into the lowlands at Lugh, around Lake Rudolf and at Archer's Post (Kenya Colony).

4. Teratolepis tropidolepis Mocquard

Hemidactylus tropidolepis Mocquard, 1888, Mem. Cent. Soc. Philom. Paris, p. 113.

6 ♂ ♂, 3 ♀ ♀ Haud, 2200–2500 ft., 45°50′–46°9′E x 8°00′–8°21′N
2 ♂ ♂ Ado, 2100 ft., 45°15′E x 7°20′N

These 11 specimens agree with the series previously collected by Capt. Taylor in the Nogal Valley (Parker, 1932, p. 342) except that the differences in pholidosis noted there are found not to be correlated with sex, as was then supposed, and in a slightly greater range of femoral pores, 6 to 10. Probably the value of femoral pores in distinguishing the species of this genus and of *Hemidactylus* has been over-rated (c.f. *Teratolepis ophiolepis*, *supra*) so that the view previously expressed, that *squamulatus* Tornier may be distinguished from *tropidolepis* by the greater number of pores, has less to support it. The very strong keeling of the dorsal scales, their size and linear arrangement are, however, quite characteristic of *tropidolepis*, though the geographical distribution of the two suggests that Calabresi's (1924) interpretation of them as subspecies may prove to be a correct one. *T. tropidolepis* is known from the Haud and Nogal Valley in British Somaliland, ranging southwards through the Ogaden to Bardera, Dolo, the lower Webi Shebeli and northern Kenya; it appears to frequent sandy country with patches of grass and thorn scrub and is probably nocturnal, being found by day concealed under stones or logs. *T. squamulatus* has been recorded from the Anglo-Egyptian Sudan, Uganda, Kenya and Tanganyika Territory; Loveridge (1937) classes it as a form of the coastal plains and upland savannahs.

HEMITHECONYX Stejneger

This genus contains but two known species, one confined to the Sudanese districts west of Nigeria, and the other to the Somali Peninsula.

HEMITHECONYX TAYLORI Parker

H. taylori Parker, 1930, Ann. Mag. Nat. Hist. (10), **6**, p. 603; Scortecci, 1931, Atti Soc. Ital. Sci. Nat., **70**, pl. iii.

2 ♂ ♂, ♀	Oadwenia,	3500 ft., 45°05′E x 9°24′N
♀	Haud,	2100 ft., 46°19′E x 8°14′N
♂	Hargeisa,	4100 ft., 44°E x 9°35′N

This species seems to be almost confined to British Somaliland. It has been recorded in addition to the above-mentioned specimens from the Nogal Valley, Buran district and Sol Haud, in the British Protectorate and from Gardo in Italian Somaliland close to the border. It is probably extensively distributed in the northern parts of the Ogaden also, but owing to its nocturnal habits has not been collected. During the day time it is usually found concealed beneath stones and when disturbed emits a coughing noise; the three examples taken at Oadwenia in January were found together 3 feet underground where they were presumably aestivating through the dry season.

Holodactylus

I. Upper surface of the head flat; 13-18 upper labials.............. ....*H. cornii* Scortecci

II. Upper surface of the head convex; 9-11 upper labials........... ....*H. africanus* Boettger

1. HOLODACTYLUS CORNII Scortecci

H. cornii Scortecci, 1931, Atti Soc. Ital. Sci. Nat., **70**, p. 137, fig.

The status of this species is somewhat doubtful (c. f. *H. africanus* below); it is known from the vicinity of Obbia and near Gardo in Italian Somaliland and from the Nogal Valley in the British Protectorate.

2. HOLODACTYLUS AFRICANUS Boettger

H. africanus Boettger, 1893, Zool. Anz., **16**, p. 114.
H. aculeatus Calabresi, 1915, Mon. Zool. Ital., **26**, p. 238, fig.

4 ♂ ♂, 8 ♀ ♀	Haud,	2100–3800 ft., 44°24′–46°20′E x 8°15′–8°52′N
♂	Guban,	3000 ft., 42°35′E x 10°40′N
2 juvs.	Burao,	3500 ft., 45°33′E x 9°31′N

Scortecci (1931, p. 134) has drawn attention to the fact that, in a series of *Holodactylus africanus* from Italian Somaliland, one example from the Lower Shebeli Province (Villagio Duca Abruzzi), in the extreme south, has the dorsal granules perfectly smooth, whereas in others from near Obbia and Gardo (i.e. further north) the granules are covered with confluent rugosities. In the series available to the present author it is also noticed that all the specimens from the Haud and Nogal Valley have the dorsal granules beset with rugosities which often culminate in a distinct median keel, whereas in another example from the Rahanuin country (approximately 3°30′N x 43°30′E) the dorsal granules are quite smooth. But, in addition, eight examples from the extreme north (Guban and mountains of the Ogo) resemble the southern form in having the granules quite smooth. Thus, once again, there is apparently the beginning of racial differentiation, with the mountain chain south of the Guban forming a boundary line.

The series also shows variation in other respects, though these differences cannot be correlated with geography. The supranasal shields are by no means constant. In the present collection those from the western Haud show every condition between large, well marked supranasals and their complete absence, and among those from the Guban only one specimen has them developed. The length of the tail, too, shows considerable variation and this cannot, as has been suggested (Parker, 1932, p. 350) be correlated with seasonal change, but appears rather to be an age character. In two juveniles, measuring 42 and 47 mm. from snout to vent, it is 38 per cent and 36 per cent of the length of the head and body, and there is an almost regular decrease with increasing size to 29 per cent and 30 per cent in the two largest individuals which measure 83 and 85 mm. respectively from snout to vent. The length of the tail relative to its breadth varies from 2.8 to 4.0 in the nine specimens collected in the Haud during April, and this range of variation is sufficiently great to include all variations at other times of the year, except in very young specimens where, on account of the proportionally greater length of the organ, the length-breadth ratio may be as high as 5.0 to 5.3.

The fact that the supranasals are so inconstant in their degree of development and the tail so variable in its size indicates the possibility of *H. cornii* no longer being tenable. But no examples with the flat head ascribed to *cornii* have been seen which can be definitely linked with *africanus.*

The species ranges from the sea in the north and east to the Juba River and westwards to about 43°30′E (type locality) in the central

Ogaden. It is nocturnal and was found by Capt. Taylor usually in the vicinity of termites' nests feeding on the winged insects as they emerge.

Lygodactylus

I. A single series of enlarged plates beneath the unregenerated tail . . . . *L. picturatus*
II. A double series of enlarged plates beneath the tail . . . . *L. somalicus*

Lygodactylus picturatus

Hemidactylus picturatus Peters, 1870, Mon. Ak. Berlin, p. 115.

Lygodactylus picturatus, or one of its races, has been recorded on several occasions from Somaliland (Scortecci, 1931, idem, 1930; Boulenger, 1891; idem, 1895; idem, 1896; Mocquard, 1888; Calabresi, 1915; idem, 1927) but the majority of these records are from the south of the Italian colony and none are definitely within the British area. It is almost certain that the most northerly record (Boulenger, 1891) is in reality based on an example of the following species.

Lygodactylus somalicus Loveridge

L. somalicus Loveridge, 1935, Proc. Biol. Soc. Washington, **48**, p. 195.
L. somalicus annectens Loveridge, loc. cit., p. 197.

7 ♂ ♂, 5 ♀ ♀ Haud, 2100–3900 ft., 44°20′E–46°25′E x 8°15′–8°52′N

Until 1935 this species had been recorded from Somaliland as *L. capensis*, *L. scheffleri*, *L. conradti* or *L. picturatus* (Boulenger, 1891). But Loveridge then showed that the *Lygodactylus* of Somaliland is distinct. At the same time he recognised two races, one, the typical, ranging from the Nogal Valley to Bera in Italian Somaliland and the other, *annectens*, from the Buran District to the Juba River, i.e. from localities to the north, east and south of the typical form. The two were said to be distinguished by the condition of the mental, fissured only in *annectens*, but completely divided in the other. The present series, from localities to the west of the type locality, has the mental deeply fissured, and re-examination of five paratypes of the typical race shows that in three of these also the suture is incomplete, though a fold, probably due to the manner of preservation, connects the ends of the fissures and simulates a complete suture. Accordingly the validity of the two races must be considered very doubtful indeed; in some individuals the two fissures may unite to sever the mental completely, but normally this is not the case.

This species does not appear to extend westwards or northwards over the mountain ranges which border the Haud, and ranges southwards to the Juba River. In British Somaliland it has been recorded across the Haud from 44° 20′ E to the Nogal Valley northwards to the Buran District and Burao. It is essentially diurnal and arboreal.

Platypholis fasciata erlangeri (Steindachner)

Homopholis erlangeri Steindachner, 1906, Ann. Hofmus. Wien, **21**, p. 149, pl. vii.

Until recently (1932) *erlangeri*, originally described from specimens taken near "Umudu" (= ?Afmadu) close to the Juba River, was considered a synonym of *fasciata* and all Somali records of the former appear under the latter name. Typical *fasciata* is a southern form, found in Kenya and Tanganyika Territory, whereas the specimens from British Somaliland examined by the author agree in colour with *erlangeri*. Where the two intergrade is uncertain.

The species is arboreal and known in British territory only from the Sol Haud and Buran.

Pristurus

I. Rostral shield entering the anterior border of the nostril.
  A. Tail strongly compressed with a crest of lanceolate scales longer in males than in females; adult males usually have the crest carried forwards on the dorsal line of the body and females may have a row of enlarged scales . . . . *P. flavipunctatus.*
  B. Tail scarcely compressed, with a feeble crest or row of enlarged scales in males only, never extending on to the body *P. rupestris.*

II. Rostral shield excluded from the nostril.
  A. Claws much longer than the ungual scales; digits long and slender; 18–23 lamellae beneath the fourth toe . . . . *P. crucifer.*
  B. Claws shorter than the ungual scales; digits short; 14–19 lamellae beneath the fourth toe . . . . *P. phillipsi.*

1. Pristurus flavipunctatus Rüppel

Pristurus flavipunctatus Rüppel, 1835, N. Wirbelthiere Fauna Abess., Amph., p. 17, pl. vi, fig. 3.

Pristurus percristatus Boulenger, 1896, Ann. Mus. Genova, (2), **16**, p. 547.

Pristurus percristatus pseudoflavipunctatus Scortecci, 1935, Atti Soc. Ital. Sci. Nat., **74**, p. 123.

♂, ♀	Burao, 3500 ft.
♂, ♀	Bohodle, 2100 ft.
8 ♂ ♂, 2 ♀ ♀	Haud, 2200–3900 ft. 46°25′–44°20′E 8°15′–8°55′N
4 ♂ ♂, 2 ♀ ♀	Borama District, 5000 ft. 43°20′E 9°50′N
2 ♂ ♂	Ado, 2100 ft. 45°15′E 7°20′N
♂, ♀	Near Zeilah, 150 ft.

In a previous paper (1932, p. 347) the author referred certain specimens from British Somaliland to *P. percristatus* Boul. with an element of doubt, for they had much less developed vertebral and caudal crests than typical *percristatus* and so appeared to approach the condition of *flavipunctatus*. Scortecci discovered a similar condition in specimens collected at various localities in Italian Somaliland and considered the differences to be constant and to indicate the existence of a distinct southern subspecies which he called *pseudoflavipunctatus* (Scortecci, 1935, p. 123) and which differed from the typical Eritrean form in its smaller size, less developed caudal and dorsal crests and the abdominal scales being granular instead of flat and subimbricate.

The new material now available makes it evident that the height of the dorsal and caudal crests is variable, probably with age. Thus of the four males collected together in Lat. 8° 35′ N., Long. 46° 25′ E two have long spines in the dorsal crest (measuring 0.04–0.045 mm. at midbody) whereas in the other two the spines are scarcely more than enlarged granules and are only half as long (0.015–0.025 mm.); further, the two with the shorter crests are smaller animals (28–30 mm. as compared with 31 and 32 mm. from snout to vent). Similarly of the four males collected in the Borama District, two examples measuring 35 mm. from snout to vent have dorsal spines of 0.030 to 0.045 mm., whereas the smallest of the series measuring 30 mm. has a very much shorter crest, 0.015 mm. high, and of the two from Ado the larger, measuring 32 mm. has a crest of 0.04 mm. and the smaller, 30 mm., has a crest of only 0.02 mm. Of the whole series examined, no male of less than 30 mm. has a crest of more than 0.025 mm., whereas in examples of more than 30 mm., the length of the crest varies from 0.03 to 0.045 mm. The only remaining character utilised by Scortecci to distinguish "*pseudoflavipunctatus*" is the condition of the ventral scales. Boulenger

(1896, p. 549) has considered the same character to be valueless in the allied species *P. collaris,* and the present series has examples which by the length of the dorsal crest are typical *pereristatus* but have the ventral condition of *pseudoflavipunctatus.* Accordingly it seems probable that the length of the dorsal crest increases with age and the range of variation with growth is large enough to include the described conditions of *pereristatus, pereristatus pseudoflavipunctatus* and *flavipunctatus.* Thus, the 5 cotype males of *pereristatus* available to the author measure 34–35 mm. from snout to vent and have spines in the dorsal crest of 0.034 to 0.045 mm., and so resemble exactly the largest males of the present series. The cotypes of *pereristatus flavipunctatus* are smaller, ranging in size from 24 to 34 mm. and have a shorter crest of the order of 0.01 to 0.02 mm., and the largest type of *flavipunctatus,* also with a short crest, is 29.1 mm. from snout to vent. There can be little doubt that these three names all refer to the same species of the genus in northeast Africa. It is probable that some records of *flavipunctatus* refer to the terrestrial *rupestris.*

The species is, as mentioned above, arboreal and, like all members of the genus, diurnal and particularly agile and swift in its movements. It ranges from the Anglo-Egyptian Sudan to Italian Somaliland as far south as Dolo, and south-eastern Arabia. In the British Protectorate it appears to be widely distributed in all areas where acacias are to be found from sea-level to 5000 feet.

2. Pristurus rupestris Blanford

P. rupestris Blanford, 1874, Ann. Mag. Nat. Hist. (4), **13**, p. 454.
P. flavipunctatus (non Rüppel) Parker, 1932, Proc. Zool. Soc. London, p. 347.
? P. migiurtinicus Scortecci, 1935, Atti Soc. Ital. Sci. Nat. **74**, p. 121.

6 ♂ ♂, 4 ♀ ♀	Borama District, 5000 ft., 43°10′–43°25′E x 9°50′–9°55′N
2 ♀ ♀	Ogo, 5000 ft. 43°E x 10°05′N
♀	Guban, 150 ft., 43°15′E x 11°25′N

This species has only once previously been recorded from Somaliland under the name *rupestris,* by Scortecci (1935, p. 119) who gave a full description of his single male in the belief that it might represent a distinct geographical race. It seems probable that he was led to this conclusion by comparison with the so-called *rupestris* of Sokotra, from which Somaliland examples of *rupestris* do indeed differ in the characters he mentions, i.e. a less depressed head, the length of the digits and a lower number of subdigital lamellae. But as the author has recently shown (1938) the gecko of Sokotra is really referable to a

distinct species, and comparison of the Somali material with a long series from Arabia, from Aden to the Persian Gulf, fails to reveal any differences which might indicate racial differentiation. The number of subdigital lamellae in the present series varies from 18–21 beneath the fourth toe and in the 30 Arabian examples from 18–24.

These small, diurnal geckoes are terrestrial, and though widely distributed from Karachi through southern Iran and the islands of the Persian Gulf to south-eastern Arabia, they appear to be confined to the coastal plain and mountain zone of Somaliland; no specimens have been recorded from the districts to the south of the mountains.

3. Pristurus crucifer (Val.)

Gymnodactylus crucifer Valenciennes, 1861, Compt. Rend. Ac. Paris, **52**, p. 433.
Pristurus stefaninii Calabresi, 1927, Atti Soc. Ital. Sci. Nat., **66**, p. 21.

17 ♂ ♂ 9 ♀ ♀ from various localities in the Haud from Burao to Ado and in the mountains of the Borama District at altitudes of from 2100 to 5300 ft.

Scortecci (1935, p. 133) has drawn attention to the fact that, although this species is generally characterised by a claw much longer than the penultimate phalanx there are certain individuals which have a shorter claw, produced by wear. As might be expected, this is largely correlated with the substratum on which the animal lives, and in the present series very long, pointed, scarcely curved claws are found on those specimens collected in sandy country, shorter, blunter claws on individuals from localities of stony sand and the shortest claws of all on those from rocky localities.

A wide-spread species occurring throughout the Somali Peninsula and extending north-westwards to Eritrea and into south-eastern Arabia.

4. Pristurus phillipsi Boulenger

P. phillipsi Boulenger, 1895, Ann. Mag. Nat. Hist. (6), **16**, p. 165, pl. vii, fig. 1.
P. crucifer (part) idem, 1891, Ann. Mus. Genova, (2), **12**, p. 6.
P. somalicus Parker, 1932, Proc. Zool. Soc. London, p. 349.
P. phillipsi somalicus Scortecci, 1935, Atti Soc. Ital. Sci. Nat., **74**, p. 152.

♀ Haud, 2100 ft., 46°20′E x 8°15′N

Scortecci (*loc. cit. supra*) has given reasons for considering *somalicus* and *phillipsi* to be conspecific, though he prefers to retain the two names, using them subspecifically. But both forms occur together in the same localities so that they can hardly be true subspecies. They

may well be ecological races confined to different habitats, but whether trinomials can properly be used for such modifications seems doubtful. There is no generally recognised method of designating such races and to use the same notation as is used for subspecies, must inevitably lead to confusion. For the present, at least, it seems advisable not to attempt to label these little understood variants.

P. phillipsi is known only from the Somali Peninsula, ranging from Dorianle in the south (Calabresi, 1915) to the Golis Mountains near Berbera and thence eastwards to the coast.

Ptyodactylus hasselquisti (Donndorff)

Lacerta hasselquisti Donndorff, 1789, Zool. Beytr. Leipzig, **3**, p. 133.

2 ♂ ♂, 4 juvs. Guban, 150–3500 ft., 42°40′E–43°15′E x 10°30′–11°25′N

This gecko has only once previously been collected in Somaliland, by Neumann in the area between Zeila and Jaldessa (Tornier, 1905; Neumann, 1905). Though widely distributed over Northern Africa, Palestine, Syria and Arabia, it does not appear to have extended its range eastwards beyond the Danakil depression. Tornier and Neumann referred their specimens to the "*var. ragazzii*", but Flower (1933, p. 763) has recently pointed out the impossibility of connoting the numerous local races of this species in Egypt by trinomials.

Tarentola annularis (Geoffroy)

Gecko annularis Geoffroy, 1827, in Savigny, Descrip. d'Egypte, **1**, Rept., p. 130, pl. v, figs. 6, 7.

? *Platydactylus delalandii* Vaillant, 1882, Miss. Revoil Pays Çomalis, p. 14.

Tarentola ephippiata (non O'Shaughnessy) Boulenger, 1895, Ann. Mag. Nat. Hist., (6), **16**, p. 106; idem, 1901, Proc. Zool. Soc. London, (i), p. 49.

9 ♂ ♂, 8 ♀ ♀, 3 juvs. from the Borama District and various localities along the boundary between this region and Zeilah at altitudes of from sea level to 5000 ft.

Vaillant's record of *Tarentola delalandii* from Lasgore (= Las Koreh) cannot be accepted; as Boulenger (1921, p. 60) has pointed out there is no doubt that many of the specimens recorded by Vaillant did not originate in Somaliland. But if the specimens really were taken at Las Koreh, they ought probably to be referred to *T. annularis*. In addition to this doubtful record two other species of *Tarentola* have been reported from Somaliland; but reexamination of the material in the British Museum fails to reveal more than one, for the records of *T. ephippiata* (indicated above) are based on specimens of *annularis*.

There seems to be no doubt that the West African *T. ephippiata* ranges into the Anglo-Egyptian Sudan, whence it has been recorded many times, but it seems probable that it ought to be deleted from the list of species inhabiting the Somali Peninsula.

The genus *Tarentola* is remarkable among the geckoes for the degree of development of the osteoderms. Hitherto these have not been recorded in the family except as irregularly scattered developments. In *T. annularis*, however, they form a complete armour over the body and limbs. In other families of lizards where a similar armour is developed the bony scutes are large and correspond in size and position with the external scales. But here again *Tarentola* is unique, for only on the upper eyelid is this correspondence to be found. Elsewhere the osteoderms are minute, and bear no relation to the scales overlying them. In a female specimen measuring 78 mm. from snout to vent the ventral osteoderms are roughly square, with rounded corners and measure approximately 0.1 to 0.13 mm. along each side; from 30 to 40 correspond with each scale at the middle of the belly. Dorsally the osteoderms are similar in size but are less regular in shape, being subhexagonal or rounded, and the number underlying the external scales varies, naturally, with the size of the latter.

The species has only been reported from the coastal plain and the adjacent mountains in British Somaliland; its centre of distribution is the Egyptian region and the Ogo and Guban are the limits of its distribution to the east, where it has apparently failed to penetrate into the Haud and Ogaden.

TROPIOCOLOTES

Since Boulenger recorded a rough-scaled *Tropiocolotes* from Biji, Somaliland, in 1901, the species has not been re-discovered there until the present time, and no further records have appeared which bridge the distributional gap between this area and northern Egypt. These rough-scaled geckoes have a wide distribution over northern Africa, but there is some evidence that there may be several species or geographical races. The material available can be subdivided as follows:

I. Anterior chin-shields large, reaching and forming a long suture with the second lower labial; posterior chin-shield completely separated from the first lower labial. Scales about the middle of the body 44–48. Distribution: Tunisia, Libya, N. Egypt (8 specs.)............................ *T. tripolitanus* Peters[1]

[1]Vinciguerra (1931, p. 251) regards *T. nattereri* Steindachner as a synonym of *tripolitanus;* but it is described and figured as having smooth scales so that this disposition of the name cannot be maintained.

II. Anterior chin-shields usually not reaching the 2nd lower labial; posterior chin shields, when present, usually in contact with both the first and second lower labials. Scales about the middle of the body 35–41.

A. Posterior chin-shields obvious; supraorbital scales smaller than those on the interorbital region, juxtaposed. Distribution: Western British Somaliland. . . . . *T. somalicus* spec. nov.

B. Posterior chin-shields hardly distinguishable from the gular scales. Supraorbital scales larger than those of the interorbital region, imbricate. Distribution: Rio de Oro. . . . . *T. occidentalis* spec. nov.

It may ultimately prove that these two new "species" are only geographical races of *tripolitanus,* or that there is a single race ranging from the extreme east to the west of the continent to the south of the typical form. Certainly the two bear a greater resemblance one to another than either does to *tripolitanus,* but the differences appear sufficient to justify the present tentative arrangement.

Tropiocolotes somalicus spec. nov.

Tropiocolotes tripolitanus (non Peters) Boulenger, 1901, Proc. Zool. Soc. London, p. 48.

The holotype of T. *somalicus* is a male, number 1937.12.5.693 in the British Museum from 42° 50′E, 10° 20′N at an altitude of 3000 ft.; collected by Capt. R. H. R. Taylor 27. vii.33.

Snout a little longer than the distance between the eye and the ear. Head covered with keeled granules; rostral broader than high, with a median cleft; nostril pierced between the rostral, first upper labial and 2 small nasals; seven upper and six lower labials; mental large, triangular, followed by a pair of large chin-shields which form a median suture; posterior chin-shields much smaller and widely separated, making contact with the first and second lower labials. Scales of the body, both dorsal and ventral, large and strongly keeled, about 37 round the middle of the body, 4 of the largest dorsals equal in length to the distance between the nostril and the anterior border of the eye. Limbs covered with strongly keeled scales; hind-limb reaching the elbow; subdigital lamellae tricarinate.

Grey-brown above, with a few darker flecks; a dark brown band from the nostril through the eye, above the shoulder; upper lip white,

brown spotted; anterior border of eye white; tail with alternating light and dark transverse bars; lower surfaces white, with a few, very small dark dots.

Length from snout to vent	28 mm.
Tail (regenerated)	35 mm.
Fore-limb	9 mm.
Hind-limb	14 mm.

The paratypes are all very similar in general proportions; their localities, sexes and scales about the middle of the body are:

43°E x 10°45′N, 3000 ft.	2 ♀ ♀, ♂	37, 39, 41.
43°15′ x 11°25′N 150 ft.	2 ♂ ♂, ♀	39, 35, 35.
Biji	♀	36.

The species appears to have a very limited distribution and to be confined to the very arid country of the coastal zone; all the specimens were taken in the ground in sandy country with patches of stones and almost devoid of vegetation.

Tropiocolotes occidentalis spec. nov.

Tropiocolotes tripolitanus (non Peters) Günther, 1903, Novit. Zool., **10**, p. 298.

Holotype a male, number 1908.6.13.15 from the Rio de Oro, collected by Herr Riggenbach.

Snout a little longer than the distance between the eye and the ear. Head covered with feebly keeled, imbricate scales; rostral broader than high, with a median cleft; nostril pierced between the rostral, first upper labial and two small nasals; seven upper and six lower labials; mental large, triangular, followed by a pair of chin shields which form a median suture and do not reach the second lower labial; posterior chin-shields absent. Scales of the body, both ventral and dorsal, large and strongly keeled, about 41 around the middle of the body, 4½ of the largest dorsals equal in length to the distance between the nostril and the eye. Limbs covered with strongly keeled scales; hind limb reaching between the elbow and the wrist; subdigital lamellae tricarinate.

Pale straw-colour above; a brown band from the eye, above the shoulder; upper lip and anterior border of the eye whitish; dorsum with a series of about seven indefinite, wavy, transverse brown bars; tail with regular brown cross-bars; lower surfaces of head and body white, of the tail pale brown.

Length from snout to vent	30 mm.
Tail	36 mm.
Fore-limb	9 mm.
Hind-limb	13 mm.

The paratype is a juvenile male from the same locality as the holotype. It agrees with the latter except in having 40 scales round the body, a slightly longer hind-limb (the third toe reaches the elbow) and in having the dorsal cross-bars less distinct and broken up into blotches.

AGAMIDAE

Agama

I. Tail longer than the head and body, not depressed.
  A. A distinct crest of enlarged, lanceolate scales on the nape....... ....*agama spinosa*
  B. No nuchal crest, or only a few spinose, not lanceolate scales.
    1. A dorso-lateral fold from the sides of the neck to the groin; dorsal scales heterogeneous.
      a. Whole of the dorsum beset with large spines each of which has a ring of smaller spines at its base........*A. robecchii*
      b. Spines, if present, confined to the dorso-lateral fold.
        i. Dorsum, between the dorso-lateral folds and flanks, with scattered, slightly enlarged scales............. ....*A. cyanogaster*
        ii. Mid-dorsal area without scattered enlarged scales.
          † Flanks with a few scattered, enlarged scales; a golden mid-dorsal stripe. Adult males *circa* 70–90 mm..............................*A. phillipsi*
          †† Flanks covered with uniform, small smooth scales. Adult ♂ *circa* 110–120 mm.........*A. annectans*
    2. No dorso-lateral fold; dorsal scales large and homogeneous.
      a. Spines about the ear partially concealing it, and as long as the diameter of the eye opening; adult ♂♂ 58–88 mm.; ♀♀ 76–88 mm...................*A. rueppelli rueppelli*
      b. Spines about the ear only half as long as the eye opening and not encroaching upon the tympanic area; tympanum fully exposed; adult ♂♂ 43–54 mm., ♀♀ 56–64 mm.... ....*A. persimilis*

II. Tail much shorter than the head and body, strongly depressed, with a disc-like basal portion.
  A. Basal portion of the tail longer than broad, merging gradually into the terminal filament, with marginal spines not markedly greater than those on its upper surface..................*A. batillifera*

B. Basal portion of the tail broader than long, abruptly differentiated from the terminal filament and with very large marginal spines. . . . . *A. taylori*

In addition to these species Vaillant (1882) reports *Agama agilis* and *A. ruderata* from Las Goré (= Las Khoreh). But these records seem very improbable and the species have been omitted from consideration.

The following species may ultimately be found in the Protectorate also:

Agama bottegi Boulenger	Type locality:	Lugh
Agama cornii Scortecci	" "	Om-Ager, Eritrea
Agama lionotus Boulenger	" "	S. E. of Lake Rudolf
Agama zonura Boulenger	" "	"Wardergubbernor"

(This may be the "Wal da Gubora's Capitol" in 7°10′N x 40°41′E, approximately, shown on Donaldson Smith's map in the Geographical Journal 1895, **5**, p. 124, otherwise known as Gineh, Ginea, or Ginir. The species has also been recorded from Harrar (Tornier 1905; Erlanger 1905).

1. Agama agama spinosa Gray

Agama spinosa Gray, 1831, in Griffith, Cuvier's Animal Kingdom, **9**, Syn., p. 57, pl.

Agama colonorum Boulenger, 1895b; *idem*, 1898; Tornier, 1905; Neumann, 1905; Scortecci, 1929.

Agama hartmanni (nec Werner, nec *doriae* Boul.) Boulenger, 1901.

15 ♂ ♂, 6 ♀ ♀, 11 juvs. from various localities along the boundary northwards and westwards from the Borama District (43°10′E x 10°N) to 43°15′E x 11°15′N, at altitudes of from 500 to 5000 feet.

Flower (1933, p. 772) has expressed the opinion that *Agama spinosa* Gray may be one of the numerous local races of the wide spread *Agama agama*. This certainly seems very probable, and explains how it is that the three closely allied forms *A. spinosa*, *A. colonorum* (= *A. agama*) and *A. hartmanni* have all been recorded from British Somaliland. These three forms have all been recorded from the same general area, the costal plain and adjacent mountains, and it seems highly probable that only a single species is involved. The correct name to apply to this would appear to be *spinosa* Gray, though it must be admitted that many specimens from Somaliland differ widely from typical *spinosa* in having a much shorter nuchal crest, shorter spines about the ear and smaller, less strongly keeled dorsal scales. But the above-mentioned large series shows an enormous amount of variation in these characters

and yet appears to represent but a single species; the variations cannot be correlated with diversity of habitat nor with altitudinal distribution. Loveridge (1936, p. 54) has stated that in his experience the variation of the number of scales around the middle of the body of any one race of *Agama agama* is 10, rarely as many as 13, in a given area. Yet the present series varies from 59 to 80 in this respect and other examples from near Berbera and the Golis Mountains extend this range up to 90; I am unable to detect any discontinuity which would indicate that two species are involved. In typical *spinosa* from the Egyptian region the number of scales around the middle of the body varies from 62 to 74 (18 specs. examined).

In a previous publication (1932) the author placed *agama smithi* in the synonymy of *A. spinosa*, but it is doubtful whether this disposition is justified.

Agama agama spinosa is strictly terrestrial, and an inhabitant of rocky and stony districts. As pointed out above, it is confined to the coastal plain and maritime mountains, as far east as the Wagar range, a distribution characteristic of so many other Eremian species which have failed to extend their range into the Haud and south-eastern drainage.

2. Agama robecchii Boulenger

Agama robecchii Boulenger, 1891, Ann. Mus. Genova, (2), **12**, p. 6, pl. i, fig. 1.

This species appears to have a very limited distribution in the sultanates of Obbia and Migiurtina and has only once been recorded in British Somaliland, from Gumbi Hill (10°16′N x 47°12′E).

3. Agama cyanogaster (Rüppell)

Stellio cyanogaster Rüppell, 1835, N. Wirbelthiere Fauna Abess., Amph., p. 10, pl. v.

Agama atricollis A. Smith, 1849, Ill. Zool. S. Africa, Rept., App., p. 144.

♀ 43°E x 10°10′N.

Boulenger as long ago as 1896c, pointed out that *cyanogaster* appeared to pass completely into *atricollis* and suggested that the two might have to be united. Specimens have been recorded from the Ethiopia-Somali region under both names and Loveridge (1936, p. 57) maintains that the two are distinct species, *cyanogaster* being a much smaller form, measuring not more than 70 mm. from snout to vent. It seems highly probable, however, that Loveridge's "*cyanogaster*" is really *phillipsi*, for the type of *cyanogaster* measures 113 mm.

A. cyanogaster, including *atricollis,* is widely distributed over eastern Africa from the Cape Province to the mountains of Ethiopia and Eritrea. It has only previously been recorded (as *atricollis*) from British Somaliland in the extreme east, at Buran and Taleh by Calabresi (1927, p. 27); one of the same specimens was apparently referred by Scortecci (1931, p. 142) to *cyanogaster.* It is possible, however, that this identification is incorrect, for Capt. Taylor failed to collect the species in that region though the allied *A. annectans* was plentiful, but was not reported by either Scortecci or Calabresi.

4. Agama phillipsi Boulenger

Agama phillipsi Boulenger, 1895, Ann. Mag. Nat. Hist., (6), **16**, p. 567, pl. vii, fig. 3.

A. cyanogaster (non Rüppell) Loveridge, 1936, p. 57.

7 ♂ ♂, 12 ♀ ♀, 10 juvs. from various localities in the Borama district (43°–43°25′E x 9°50′–10°10′N) at altitudes of from 4500 to 6000 ft.

This series is very constant in its general characters and colour. There is, however, an appreciable amount of variation in the number and size of the enlarged, keeled scales on the flanks and femora; but they are constantly present and serve to distinguish this species from *annectans* which has uniform small scales in both these regions. The absence of enlarged scales between the dorso-lateral folds distinguishes it from *cyanogaster.*

A. phillipsi appears to be a montane species, ranging from Eritrea through the mountains of north-eastern Ethiopia to the Ogo as far east as the Golis Range; no specimens have ever been reported from the Haud or the lower lying areas to the south and east. Its depressed habitus reflects its habit of hiding in rock crannies; the diet appears to consist principally of ants.

5. Agama annectans Blanford

Agama annectans Blanford, 1870, Zool. Abyssinia, p. 446, fig.

? *Agama atricollis* Calabresi, 1927, Atti Soc. Ital. Sci. Nat., **66**, p. 27.

? *Agama cyanogaster* Scortecci, 1931, Atti Soc. Ital. Sci. Nat., **70**, p. 142.

juv. ♂ Borama District, 4000 ft., 42°25′E x 10°20′N.

A. annectans was originally described from the Suru (or Sooroo) Pass in Eritrea (*circa* 39°32′E x 15°05′N), but has not since been recorded from that region, though it has been reported from Harar, 1900 meters, and the Fulla Valley, 500 meters (Tornier, 1905; Neu-

mann, 1905), various localities in southeastern Ethiopia and in the eastern parts of British Somaliland (Sol Haud, Buran District, Al Mado Mts. and Las Elan; Parker, 1932). It does not appear to range into the Haud and has not been reported from the Ogaden or countries to the south and east.

6. Agama rueppelli rueppelli Vaillant

Agama rueppelli Vaillant, 1882, in Revoil, Mission Pays Çomalis, Rept. p. 6, pl. i.

Agama vaillanti Boulenger, 1895, Ann. Mus. Genova, (2), **15**, p. 12, pl. iii, fig. 1.

Agama rueppelli rueppelli Parker, 1932, Journ. Linn. Soc. London, Zool. **38**, p. 224.

4 ♂ ♂, 5 ♀ ♀, 2 juvs. from various localities along the boundary westwards and northwards from 43°15′E to 42°40′E and 9°55′N to 10°45′N at altitudes of 2000 to 5000 ft.

This series is homogeneous and typical. The species appears to be widely distributed along the maritime plain and adjacent mountains through British Somaliland and to extend southwards through the eastern districts of the Sol Haud, Nogal Valley and eastern Haud to the Ogaden, Italian Somaliland and Kenya Colony. Its place appears to be taken in the central Haud by a smaller, allied species which has not yet received a name.

7. Agama persimilis spec. nov.

Holotype a female, number 1937. 12. 5. 64 in the British Museum, from 45°50′E x 8°N in the Haud; collected by Capt. R.H.R. Taylor on November 25th, 1934.

Head convex, the upper surface of the snout flat; nostril tubular, directed upwards and backwards in the posterior part of the nasal above the canthus rostralis. Upper head scales moderately large, those on the supraocular region longitudinally elongate, with a blunt keel; occipital scale enlarged; ear superficial, completely exposed, its diameter equal to that of the eye-opening; lower and posterior borders of the ear and sides of the neck with tufts of spines, the longest of which is about half the length of the eye-opening; these tufts of spines do not encroach upon the ear-opening. Two transverse gular folds, but no pouch. Body strongly depressed, with large, homogeneous, imbricate, keeled and mucronate scales, convergent towards the middle line except on the nuchal and occipital regions where they are reversed and point forwards; about 30 scales on the vertebral line between the anterior

limits of the insertions of the fore and hind limbs; 57 scales round the middle of the body; 9 scales of an oblique series corresponding to a length equal to that from the tip of the snout to the anterior border of the ear. Tip of the fourth toe reaching the posterior corner of the eye; third finger a little longer than the fourth, and the fourth toe slightly longer than the third; tibia as long as the skull. Tail 2.4 times as long as the distance between the posterior gular fold and the vent, depressed and tapering very abruptly in its proximal sixth, slender and cylindrical posteriorly. Ventral scales smooth, much smaller than the dorsals. General colour rufus brown, with a strongly-marked geometrical colour-pattern . Upper surface of the snout to the level of the anterior borders of the eyes pink; a broad brown bar, the full width of the supra-ocular region, across the head with an oblique extension from its posterior corners towards the ears; an oblique brown bar from beneath the eye to the anterior border of the ear; occiput pink mesially and a longitudinal stripe of the same colour extends down the midline of the back onto the tail; an oval dark brown spot on each side of the nape; three transversely elongate brown diamond-shaped blotches on the back, decreasing in size caudally, the last on the sacral region, each edged by a narrow light line and bisected by the mid-dorsal light line. An elongate, triangular, dorso-lateral brown blotch on each side runs from the shoulder to the middle of the flank where its apex is narrowly separated from the apex of a similar blotch which extends backwards to the groin; flanks beneath these two markings occupied by a single large, triangular, brown blotch, the 3 lateral and dorsolateral markings being all more or less distinctly edged with lighter. Tail with transverse dark bars, bisected mid-dorsally. Limbs with dark brown, light-edged markings. Lower surfaces uniform white.

Length from snout to vent 56 mm. Tail 95 mm. The following specimens, all collected by Capt. Taylor are the paratypes:

4♂♂, 5♀♀, 1 juv. from near Bohodle (46°20′E x 8°15′N, 2100 ft.) collected between Jan. 21st and April 1st 1932.

1♀ collected at the same time and place as the holotype.

1 gravid female from 46°09′E x 8°17′N, 2200 ft., taken on Aug. 21st, 1932.

1 juvenile from 45°09′E x 8°37′N, 3050 ft., taken on July 9th, 1932.

This series of specimens, collected in the central Haud, is very homogeneous. There are some variations in scale size, the number of scales on the mid-dorsal line varying from 26–31 and the number in an oblique series corresponding to a length equal to that between the tip of the snout and the ear, from 8–11. Adult males vary in size from

43 to 54 mm. and females from 56 to 64 mm.; in a series of twenty-three *rueppelli rueppelli* males measure from 58 to 88 mm. and females from 76 to 88 mm. The species is undoubtedly very closely allied to *Agama rueppelli rueppelli* Vaillant, which was not found in the central Haud, though common in the coastal mountains and in the countries to the east and south of the area occupied by *persimilis*. The two may be distinguished readily by the characters mentioned in the accompanying key.

8. Agama (Xenagama) batillifera (Vaillant)

Uromastix batilliferus Vaillant, 1882, in Revoil, Mission Pays Çomalis, Rept., p. 10, pl. ii.

12 ♂ ♂, 11 ♀ ♀, 4 juvs. from the mountains of the Ogo between 43°10′ and 43°30′E and 9°30′ and 9°50′N at altitudes of 4500 to 5300 ft.

This species is chiefly nocturnal in its habits, being found by day in burrows which it constructs in soft earth. The tunnels are just wide enough to permit the animal's passage, are 2 to 3 feet long and reach a depth of about a foot; there does not appear to be any definite terminal chamber or nest. The species seems to be confined to the mountains bordering the Haud on the north from 43°10′ to 50°27′E (Vaillant, 1882) and to extend into the Ogaden on its western side as far as Sasabanch (Boulenger 1895c). Within this area there may prove to be some geographic variation for the present series from the extreme west of the range of the species have a slightly narrower, less distinctly discoid tail than others from the east (10°25′N, 47°12′E). To the south, in the Haud, *A. batillifera* is replaced by

9. Agama (Xenagama) taylori Parker

Aporoscelis batilliferus (non Vaillant) Peel, 1900, Somaliland (London), pp. 175, 176, 334, fig.

Agama (Xenagama) taylori Parker, 1935, Ann. Mag. Nat. Hist. (10), **16**, p. 525.

♂, ♀ from the Haud at 3400–3500 ft., near 44°49′E x 8°43′N.

These two examples are the only ones known to exist in Museums, but the specimen described and figured by Peel almost certainly belongs to this form, which differs from the typical montane *A. batillifera* in its broader, more discoid tail. At first it was thought to represent a distinct species, but, as pointed out above, *A. batillifera* shows some geographical variation in this respect which suggests the possibility that *A. taylori* may ultimately prove to be only racially distinct. At

the present moment, however, no intermediates have been found and the degree of difference between it and any specimen of *A. batillifera* is far greater than has been recorded in the latter species over a much wider geographical area. Peel's specimens were seen in the Haud at Bally Maroli, a short distance south-east of Odaweina.

Uromastix

I. Tail only slightly shorter than the head and body; a series of preanal and femoral pores .... *U. macfadyeni*

II. Tail only half the length of the head and body; no femoral or preanal pores .... *U. princeps.*

1. Uromastix macfadyeni Parker

Uromastix macfadyeni Parker, 1932, Proc. Zool. Soc. London, p. 353.
U. ocellatus (non Licht.) Tornier, 1905, Zool. Jahrb., Syst., **22**, 4, p. 372.

4 ♂ ♂, 3 ♀ ♀, 7 juvs. from the Guban between 10° and 11°15′N and 42°40′ and 43°15′E, at altitudes of from 1000–3800 ft.

The relationships of this species to various other members of the genus *Uromastix* have already been discussed in the original description, but its nearest relative appears to be the southern Arabian *Uromastix* (*Aporoscelis*) *benti*. It appears to be so closely allied to this species that the retention of *Aporoscelis,* even subgenerically, does not seem to be justified.

It is a herbivorous lizard usually found hiding in burrows by day and seems to be confined to the foot hills of the Guban as far east as Dagah Shabell, 24 miles S.E. of Berbera.

2. Uromastix princeps O'Shaughnessy

Uromastix princeps O'Shaughnessy, 1880, Proc. Zool. Soc. London, p. 445, pl. xliii.
Aporoscelis princeps Boulenger, 1885, Cat. Lizards Brit. Mus., **1**, p. 410.

A diurnal, terrestrial species, partly herbivorous, partly insectivorous, which frequents the rocky and stony districts of the extreme north-east corner of the Somali Peninsula; in the British Protectorate it has only been recorded from the eastern boundary, from the coastal plain to the Nogal Valley (Parker, 1932, p. 351). The doubtful records of the species from Zanzibar (O'Shaughnessy *loc. cit. supra*), Aden (Vaillant, p. 10) and Asmara (Scortecci, 1933, p. 1) are probably to be ascribed to specimens either wrongly labelled or transported in coastal vessels.

VARANIDAE

Varanus

I. Nostril three times as far distant from the tip of the snout as from the eye; dorsal scales very large, especially on the neck. . . . . *V. ocellatus*

II. Nostril a little nearer the eye than the end of the snout; dorsal scales small, not appreciably enlarged on the nape. . . . *V. niloticus*

1. Varanus ocellatus Rüppell

Varanus ocellatus Rüppell, 1827, Reise N. Afr., Rept. p. 21, pl. vi.
Varanus albigularis Boettger, 1893, Zool. Anz., p. 115.

3 skins from the Haud 42°40′–44°24′E x 10°30′–8°52′N, 3500–4800 ft.

Schmidt (Bull. Amer. Mus., 1919, **39**, p. 483) has called attention to the fact that Meek's record (1897, p. 181) of *Varanus albigularis* is really based on a specimen of *V. ocellatus* and it seems very possible that other Somali records of the white-throated monitor are due to similar misidentifications. The two species are very similar and at the present time it seems almost impossible to delimit accurately the ranges of the two; *ocellatus* certainly ranges over the whole of the Somali Peninsula and the Sudan, southwards into Kenya Colony and Tanganyika Territory.

2. Varanus niloticus (Linn.)

Lacerta nilotica Linnaeus, 1766, Syst. Naturae, (12), p. 369.

There is no record of the Nile monitor from British Somaliland, though it has been reported from the Ogaden. Since it is a species seldom found far from a permanent water-supply, it is more than likely that it does not occur in the protectorate.

AMPHISBAENIDAE

Agamodon

I. Annuli on the body 133–137; on the tail 15–19; 0–6 preanal pores . . . . *A. anguliceps*

II. Annuli on the body 143–160; on the tail 18–23; preanal pores 0–2 . . . . *A. compressum*

Neither of these species has yet been reported from the British Protectorate though both are not uncommon in southern Italian Soma-

liland. Since burrowing species, such as these, are liable to be overlooked very easily, it is conceivable that they may yet be discovered; but the difference in the humidity of the soil in the Shebeli and Juba regions, as compared with British Somaliland, suggests that if the genus really does occur in the latter area it will be represented by a distinct species.

ANCYLOCRANIUM genus nov.

Type species *Anops somalicus* Scortecci, 1930, Boll. Mus. Tornio, **41**, 3, p. 6., figs. 1–5.

Stejneger (1916, p. 85) has drawn attention to the fact that *Anops* Bell 1833 (type species *A. kingi*) is preoccupied by *Anops* Oken 1815, and proposed *Anopsibaena* as a substitute generic name for the South American lizard *A. kingi*. The only other species which at that time was commonly referred to *Anops* Bell, was a West African lizard originally described by Gray in 1865 as *Baikia africana*. On purely geographical grounds Stejneger was convinced that *africana* and *kingi* could not be congeneric so that the name *Baikia* was available only for the African species. With the discovery of *somalica* there are now three known species of the "*Anops*" type and examination of their skulls confirms Stejneger's contention and also suggests that the third species represents yet another evolutionary line. These three may be distinguished thus:

I. The whole skull laterally compressed with a median crest extending from the premaxilla to the occiput; premaxilla extending backwards, separating the nasals completely and the frontals anteriorly; extra-columella not dilated anteriorly (fig. 7b) . *Anopsibaena*.

II. The skull compressed anteriorly only, the median ridge extending from the premaxilla to the parietal only, the upper surface of the latter being quite flat; premaxilla small, the nasals forming a median suture; extra-columella not dilated anteriorly (fig. 7c) . . . . *Baikia*

III. The skull compressed anteriorly only the parietal being flat above; nasals forming a median suture; compressed anterior elements of the skull forming a high crest which extends backwards over the parietal region as a pronounced hook; extra-columella dilated anteriorly to form a large, thickened pad attached to the lower labial (fig. 7a) . . . . *Ancylocranium*

These differences may be appreciated by a comparison of the accompanying figures, but some explanation is necessary with regard to

the extra-columella. A feature of all three genera, and probably of the majority of *Amphisbaenids* is the peculiar condition of the ear (Versluys, 1898, p. 82). There is no tympanum, the merest rudiment of a

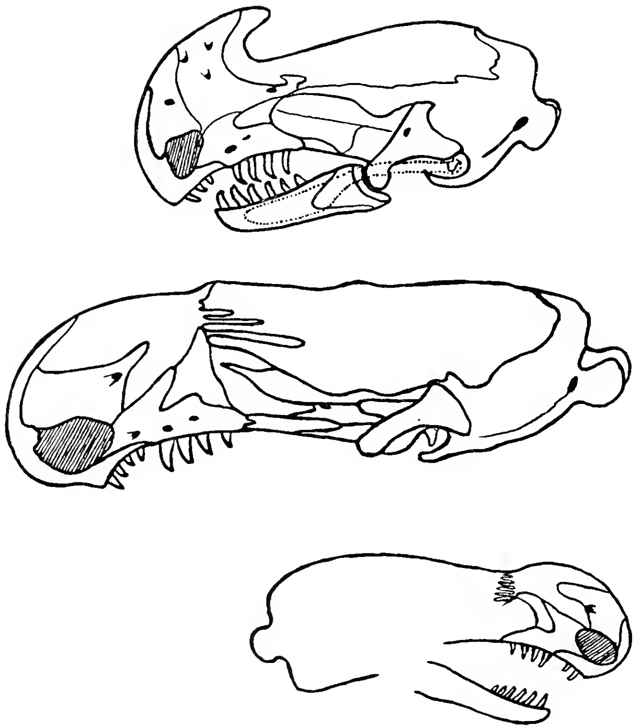

Fig. 7. Skulls of the three species formerly referred to the Amphisbaenid genus *Anops* Bell.

a. *Ancylocranium somalicum* (Scortecci). Somaliland. Extra-columella indicated by dotted outline.

b. *Anopsibaena kingi*. South America.

c. *Baikia africana* (Gray). West Africa.

Type and only known specimen; outline from X-ray photograph; sutures anteriorly determined by dissection.

cavum tympanum and no eustachian tube; the columella auris is short, and owing to the forward rotation of the lower end of the quadrate the fenestra ovalis lies ventral to, rather than behind, this

bone. Attached to the outer end of the columella is a long cartilaginous rod, the extra-columella; this rod runs forwards over the outer surface of the quadrate and along a groove on the ventro-lateral surface of the mandible and is attached anteriorly by fibrous ligaments to the corium of the lower labials. In *Ancylocranium* the anterior end of this extra-columellar rod is expanded to form a large thickened pad underlying and attached to the whole length of the enlarged second lower labial. It seems probable that this modification permits the ear to function more effectively in detecting vibrations in the soil with which the chin is normally in contact.

Ancylocranium somalicum (Scortecci)

Anops somalicus Scortecci, 1930, Boll. Mus. Torino, **41**, p. 6, figs. 1–5.
Baikia somalica Loveridge, 1941, Bull. Mus. Comp. Zoöl., **87**, p. 370, fig. 6.

Ad. Haud, 2100 ft. 46°E x 8°20′N, 29. iv. 32.
Ad. Haud, 2300 ft. 45°58′E x 8°24′N, 5. v. 32.
Ad. Haud, 2350 ft. 45°43′E x 8°26′N, 18. v. 32.

These specimens show some slight variation beyond that already described for the species. The segments in an annulus vary from 30/21 to 32/23 (vice 27/22, 28/24), there are from 186 to 193 annuli on the body (197–199) and from 7 to 8 on the tail (vice 6–7). Thus these three examples from the Haud differ appreciably from the only other known examples of the species, the types from Caitoi on the Webi Shebeli. It is not improbable that the differences are really indicative of racial differentiation but far too little is at present known of the stability or variability of these lizards for it to be possible to form any definite opinion on the point.

LACERTIDAE

Eremias

I. Upper head-scales smooth or only slightly rugose; dorsal scales smooth or feebly keeled, never tricarinate.
  A. No granules between the supra-oculars and the frontals and fronto-parietals. Usually three nasals . . . . *E. guttulata olivieri*
  B. A ring of granules bordering the supra-oculars. Usually four nasals.
    1. Dorsal scales smooth. Dorsal pattern of 5 stripes of which the two laterals on each side may be broken up.

a. Posterior subcaudals smooth; ventrals in 6 longitudinal series with traces of an additional row on each side; subocular usually entering the lip . . . . *E. mucronata*

b. Posterior subcaudals keeled; ventrals in 8 longitudinal series with traces of an additional row on each side; subocular excluded from the upper lip . . . . *E. smithi*

2. Dorsal scales smooth or keeled; posterior subcaudals smooth or keeled; dorsal pattern of 7 stripes, none broken up. Subocular entering the lip . . . . *E. septemstriata* sp. n.

3. Dorsal scales keeled; posterior subcaudals keeled; dorsal pattern of irregular spots; subocular excluded from the lip . . . . *E. erythrosticta*

II. Upper head scales rugose or strongly striated; dorsal scales usually tricarinate.

A. Snout long; toes unicarinate or with additional keels much smaller than the median.

1. Fronto-nasal distinctly longer than broad; femoral pores 17–25; three or four nasals; head shields finely or strongly striated; subocular excluded from the lip; a pattern of 5 dark longitudinal stripes of which at least the outermost encloses rows of circular white spots . . . . *E. brenneri*

2. Fronto-nasal a little broader than long; femoral pores 13–17; four, rarely three, nasals; head shields rugose; subocular usually entering the lip; 5 dark longitudinal stripes without any trace of light spots . . . . *E. striata*

B. Snout short, the fronto-nasal much broader than long; three nasals; toes bicarinate; five or seven dark stripes bearing rows of black blotches; subocular excluded from the lip . . . . *E. spekii sextaeniata*

Eremias guttulata olivieri (Audouin)

Lacerta olivieri (part) Audouin, 1829, Descr. d'Egypte, Rept. Supp., p. 175, pl. ii, fig. 2.
Eremias guttulata Tornier, 1905, Zool. Jahrb. Syst., **23**, p. 379.
Eremias guttulata martini Neumann, 1905, Zool. Jahrb. Syst., **23**, p. 396.

14 ♂ ♂, 6 ♀ ♀, 1 juv. from various localities on the boundary between 42°40′ and 43°15′E x 10°20′ and 11°25′N, at altitudes of from 0–3500 ft.

Criticism has already been levelled at the varieties of *Eremias guttulata* recognized by Boulenger (1921), many of which occur to-

gether in the same localities and so do not appear to be true subspecies. On geographical grounds the form occurring in Somaliland should be *martini*, but in the foregoing series, whilst some individuals have the striped colour of *martini*, others are not distinguishable from the typical form of *olivieri*, and the morphological characters are those of the latter; there are 4 to 7 enlarged plates in the lower eyelid, 37 to 46 scales across the middle of the back and 9 to 14 femoral pores. Until the whole species can be satisfactorily revised, it is difficult to know how to treat the various "races." Flower has pointed out (1933, p. 798) that the *forma typica* is the normal form in Egypt but that specimens referable to *martini* and *olivieri* occur as individual variations, and it seems possible that the apparent overlapping of the races is due to the prevalence of similar individual variants in populations composed for the most part of a different form; *martini* is probably not to be distinguished from *olivieri*.

Like other northern species it only enters Somaliland in the coastal zone north of the mountains whose northern slopes it ascends to an altitude of 3500 ft.

Eremias mucronata (Blanford)

Acanthodactylus mucronatus Blanford, 1870, Obs. Geol. and Zool. Abyssinia, p. 453, fig.

Eremias lugubris (non Smith) Vaillant, 1882, Mission Révoil Pays Çomalis, Rept. p. 23.

Eremias brenneri (non Peters) Meek, 1897, Field Columbian Mus., Zool. Series, **1**, 8, Publ. 22, p. 181.

26 ♂ ♂, 14 ♀ ♀ Borama Distr., 5000 ft., 42°45′E x 10°20′N, 19–24.2.33.
♂, 150 ft., 43°15′E x 11°25′N, 14.1.34.

This series is very constant in morphological characters and in colour. Only one specimen, a male, is in any way abnormal, and there the small post-nasal is fused with the supra-nasal so that there are only three shields surrounding the nostril. The scales across the back vary from 61 to 78, ventrals are in 6 or 8 longitudinal series, the outermost always being small, and the femoral pores vary from 17 to 24. The colour is of the normal type with an unbroken median dorsal stripe, flanked with white and primitively with two broad, dark lateral stripes enclosing numerous small, circular white spots; this pattern occurs in juveniles and persists to a greater or less extent in adult females, but in males the white spots are so numerous that almost all trace of the lateral stripes is lost.

The species is a northern form which extends along the mountain chain of the north of the country and in the coastal zone. It has not yet been recorded from the region south of the mountains in British Somaliland but occurs in the Ogaden (Boettger, 1893; Boulenger, 1895, 1896) and the Sultanate of Obbia (Calabresi, 1927).

EREMIAS SMITHI Boulenger

Eremias smithi Boulenger, 1895, Proc. Zool. Soc. London, p. 534, pl. xxix, fig. 4.

3 ♂ ♂, 5 ♀ ♀ Burao, 3500 ft.
8 ♂ ♂, 11 ♀ ♀ from the mountains around Borama, 4500–5300 ft.

This series shows little variation beyond that already described for the species (Boulenger, 1921, p. 247) except that there may be as few as 61 scales across the body and only 16 femoral pores; there are never less than 8 rows of ventrals and frequently indications of an additional series on each side are present.

The species appears to range from the coastal plain through the mountains and the Ogaden southwards to Kenya Colony.

EREMIAS SEPTEMSTRIATA spec. nov.

Eremias striata (non Peters) Parker, 1932, Proc. Zool. Soc. London, p. 354.

Holotype a male, number 1931. 7. 20. 300 from the Halin district, Somaliland (9°7′N x 48°38′E) at 2000 ft., collected 14. III. 30 by Capt. R. H. R. Taylor.

The specimens mentioned in the above reference were noted to deviate from the normal of *striata*, and the additional comparative material of that species now available makes it appear more probable that they represent a distinct form which is in many ways intermediate between *brenneri* and *striata*, but differs from either in its smooth or only feebly striated head shields and dorsal scales and in the distinctive colour pattern.

Head shields smooth or very feebly rugose, disposed and proportioned as in *E. brenneri*, except that the subocular, though narrowed inferiorly, broadly enters the lip; snout long, with a fronto-nasal slightly longer than broad; constantly 4 nasals. Dorsal and lateral scales juxtaposed, smooth or feebly unicarinate, in 54 to 68 series across the middle of the body; ventrals in 8 longitudinal series; enlarged brachials and subcaudals smooth or keeled in conformity with the dorsals. Femoral pores 15–20.

Colour white or pale brown with 7 dark brown longitudinal stripes arranged as follows: A broad lateral band from the subocular through the upper part of the ear and above the limbs, extending on to the tail, and usually enclosing a single row of small circular, white spots; a dorso-lateral stripe, similar in width, extends from the posterior corner of the eye, but does not extend on to the tail and may, or may not, have a row of white spots included in it; three narrower dorsal stripes, of which the median alone extends on to the tail, the two outer varying in length, being as a rule shortest in juveniles where they may not extend backwards beyond the nape; there may also be traces of an indistinct dark, ventro-lateral stripe between the fore- and hind-limbs; lower surfaces uniform white; limbs brown, with numerous large, circular white spots.

Length from snout to vent	42 mm.
Tail (partly regenerated)	107 mm.
Fore-limb	16 mm.
Hind-limb	35 mm.

The paratypes are:

1931.7.20.301	♂	3300 ft.	Buran Distr.	(10°13′N x 48°46′E)	7.i.30.
1931.7.20.298	♀	2000 ft.	Haud	(8°N x 48°E)	2.v.30.
1931.7.20.299	♀	1900 ft.		(8°54′N x 48°54′E)	17.iii.30.
1931.7.20.306	♀	2375 ft.	Buran Valley	(10°21′N x 49°E)	2.x.29.
1931.7.20.302–305	4 juvs.	2600 ft.	Buran Valley	(10°16′N x 48°55′E)	29.xi.29.

The largest female measures 50 mm. from snout to vent, with an unregenerated tail of 125 mm., a fore-limb of 17 mm. and a hind-limb of 37 mm.

As indicated above, this species is allied to E. *striata* but also shows affinities with the northern, smooth-scaled species such as *E. mucronata* and *E. smithi*.

EREMIAS ERYTHROSTICTA Boulenger

Eremias erythrosticta Boulenger, 1891; Ann. Mus. Genova, (2), **12**, p. 10, pl. i, fig. 2.

This species was not collected by Capt. Taylor, but is probably an inhabitant of the eastern part of the country south of the maritime mountains. It was originally described from specimens collected "between Obbia and Berbera" and has since (Calabresi, 1927) been recorded from Obbia, the dunes between Obbia and Sissib and the Nogal Valley.

Eremias brenneri Peters

Eremias brenneri Peters, 1869, Mon. Ak. Berlin, p. 432.
Eremias edwardsi Mocquard, 1888, Mém. Cent. Soc. Philom. Paris, p. 115, pl. xi, fig. 1.

2 ♂ ♂ Burao, 3500 ft.
♂, ♀ Ado (45°15'E x 7°20'N) 2100 ft.
♂ Milmil (43°40'E x 8°10'N) 3000 ft.
10 ♂ ♂, 12 ♀ ♀ Haud (46°20'E x 8°15'N and 44°54'x8°42'N) 2100 and 3300 ft.

This series shows some slight variations beyond those already recorded. The dorsal sçales which are always strongly keeled and often tricarinate, vary from 58 to 72 and the femoral pores from 17 to 25. It is most surprising, however, to find that in 11 of the 27 species there are only three nasals, the lower being undivided, and in two others the condition is asymmetrical and intermediate with three on one side, and four on the other. A similar variation in the number of nasals, which completely links the subgenera *Lamperemias* and *Pseuderemias* also occurs in *E. striata* and has been recorded in *Eremias nitida quadrinasalis* Chabanaud, by Loveridge (1937, p. 283). Another interesting feature of the series is that yet again, there is a marked tendency towards erythrism in specimens from the Haud, though it is by no means as clearly marked as, for instance, in the genus *Latastia*. In the specimen showing the condition most markedly the whole of the dorsum is brick-red, with white stripes and longitudinal rows of round white spots, but without any trace of the usual darker stripes.

The species appears to have a range from the mountains south of Berbera through the Ogaden and Italian Somaliland as far south as Brava; the record from the Tana River (Stejneger, 1893) has been shown by Loveridge (1929, p. 65) to be based on an example of *E. smithi*.

Eremias striata Peters

Eremias brenneri var. striatus Peters, 1874, Mon. Ak. Berlin, p. 370.

3 ♂ ♂, 2 ♀ ♀ Haud, 46°20'E x 8°15'N, 2100 ft.
♂, 8 ♀ ♀ Haud, 44°54'E x 8°42'N, 3300 ft.

This species which has a geographical range not unlike that of the preceding, is closely allied to it and not easily distinguishable. The foregoing series makes it evident that the condition of the subocular, whether entering or excluded from the labial margin, is by no means a constant or satisfactory character, since it is excluded in 4 specimens

though entering in the remainder. The nasal condition, too, resembles that of *brenneri* for though there are usually four shields surrounding the nostril, one specimen has only three and another is asymmetrical with 4 on one side and three on the other. These facts would seem to indicate that *striata* cannot be maintained as a distinct species, but there are certain differences utilised in the accompanying "key" (p. 59) which have not yet been shown to be invalid and a conservative attitude has been adopted until more definite evidence is forthcoming.

EREMIAS SPEKII SEXTAENIATA Stejneger

Eremias sextaeniata Stejneger, 1894, Proc. U.S. Nat. Mus., **16**, p. 718.
Eremias spekii sextaeniata Tornier, 1905, Zool. Jahrb., Syst., **22**, p. 377.
Eremias spekii Scortecci, 1931, Atti Soc. Ital. Nat. Sci., **70**, p. 145.

3 ♂ ♂, 4 ♀ ♀	Haud at various localities between 46° and 46°25′E x 8°15′ and 8°30′N at altitudes of from 2100–2400 ft.
2 ♀ ♀	Borama 43°05′E x 9°55′N, 4500 ft.
3 ♂ ♂, 3 ♀ ♀	Dakhato River 42°25′E x 9°10′N, 4700 ft.
♂	Daghabur 43°30′E x 8°13′N, 3500 ft.

This series collected at very different altitudes and in different types of country shows some local variations, of which the most pronounced is found in the Haud. Here, in sandy country, at altitudes of less than 2500 feet, the scales are relatively larger, in 55 to 64 series at the middle of the body, and in other examples from the eastern Haud and Nogal Valley (Parker, 1932) the same condition is found. But in those from the rocky uplands, inland of Berbera, around Borama, Daghabur and Harrar, the scales are very much smaller and arranged in from 63 to 73 series. This difference is insufficient to warrant the nomenclatorical recognition of a distinct race since examples of *sextaeniata* from northern Kenya show a range of variation in the same character from 59 to 75; but it serves to emphasise, once again, the tendency towards differentiation which is to be found in the animals of the Haud.

E. spekii sextaeniata is considered by Loveridge (1937, pp. 493 and 495) to be a form of the coastal plain and upland Savannahs in Kenya, but its geographical range from the Gulf of Aden to northern Kenya westwards into the Abyssinian highlands is typical of his Zone 4, the Northern Desert.

Latastia

The various subspecies, which grade into one another, cannot conveniently be treated in key-form so that they have not been considered in this synopsis but are dealt with under specific headings.

I. Usually a group of small irregular scales in the middle of the pectoral region interrupting the regular linear arrangement of the ventral plates.

A. Dorsal scales not larger than the laterals, smooth, tectiform or keeled . . . . *L. longicaudata*

B. Dorsal scales larger than the laterals, strongly keeled . *L. carinata*

II. No group of small scales in the centre of the chest which is covered by regularly arranged plates similar to those on the belly.

A. Frontal with a median groove; dorsal scales keeled or tectiform . . . . *L. boscai*

B. Frontal without median groove; dorsal scales smooth and flat . . . . *L. taylori* sp. nov.

LATASTIA LONGICAUDATA Reuss

(fig. 3)

Lacerta longicaudata Reuss, 1834, Ber. Mus. Senck., **1**, p. 29.
Lacerta samharica Blanford, 1870, Geology and Zoology Abyss., p. 449, fig.
Eremias revoili Vaillant, 1882, Miss. Révoil, Pays Çomalis, Rept., p. 20 pl. iii, fig. 2.
Latastia doriai Bedriaga, 1884, Ann. Mus. Genova, **20**, p. 313.
Latastia caeruleopunctata Parker, 1935, Ann. Mag. Nat. Hist., (10), **16**, p. 527.

This species is notoriously very variable, but a survey of the material brought back by Capt. Taylor from all the boundaries of British Somaliland does suggest that the variations are, to a large extent, correlated with geographical distribution, and that many races can be recognised. But whether or not all these can be named satisfactorily is another matter, and, for the moment, it is only proposed to use names which are already in existence.

In the coastal zone both in the east and west, at altitudes up to 3500 feet, there exists a race characterised by smooth dorsal granules, 11 to 14 femoral pores and a colour pattern based on the following scheme:

Dorsum brown with 5 longitudinal series of small black or dark brown spots which tend to fuse longitudinally, more especially the

mid-dorsal series; a broad dark brown dorso-lateral stripe or series of spots from the ear to the tail, above the limbs, which may include a series of blue ocelli; flanks below this with one or two more longitudinal series of spots; the outermost dorsal, the dorso-lateral and lateral series show a strong tendency to form transverse (vertical) bars which in juveniles may be very pronounced and intensified by black lines. This is generally regarded as the typical form of the species (type locality Tor, Sinai) though there are some differences between specimens from the west (Guban) and the east. The latter have 8 longitudinal series of ventrals, although the outermost series on each side is small and rounded, and there are very numerous small scales in the centre of the pectoral region whereas in those from the Guban the pectorals are scarcely differentiated and there are only 6 rows of ventrals with, sometimes, traces of another row on each side.

On the eastern boundary of the country immediately to the south of the Al Mado Mountains in the "Buran District" (Taylor in Parker, 1932, p. 335) is a form essentially similar to the preceding in its dorsal pholidosis and colouring, but with 8 rows of ventrals, the outermost large and rectangular, and 6–9 femoral pores. The area from which these specimens came is in the general region of the type-locality of *Latastia revoili* (Vaillant, 1882) and they agree very closely with the description of that species. Immediately to the south of this zone, in the region of the Sol Haud, Nogal Valley and the eastern Haud, there is a tendency for the outermost ventral series to be reduced and the dorsals to become tectiform.

An analogous, but slightly different, form occurs to the south of the typical subspecies in the western boundary in the Ogo at altitudes of from 3500 to 5000 feet. The dorsal scales and colouring are essentially similar, though the latter is much more intense and defined, but the femoral pores are fewer in number, varying from 4 to 7, 5 and 6 being the commonest. If this montane race can be distinguished from *revoili* the name *doriai* Bedriaga (cotype examined) may be available. It should be pointed out that at altitudes of about 3500 ft. where the mountains drop down to the coastal plain both *doriai* and the typical form were taken side by side, but that, among a series of 12 of the former and 7 of the latter, there were no intermediates, there being a gap in the number of femoral pores between 7 and 10.

Between *revoili* on the east and *doriai* on the west, there occurs in the Haud at altitudes of from 2100 to 3500 ft. a very differently coloured race which also has some slight morphological differences. The dorsal scales are more or less distinctly keeled, there are only six ventral

series, and femoral pores vary from 6 to 10. In these characters there seems to be complete intergradation with *revoili* but the most characteristic difference is in the colour. The dorsum is bright, brick red with 4 longitudinal series of small pale blue or whitish spots which may also form transverse rows or be arranged quincuncially; rarely in juveniles, there may be transverse black lines between the blue spots. On the flanks are two or three longitudinal series of larger, darker blue ocelli which may fuse to form bands; more usually, however, there are transverse black lines between the ocelli which fuse to form vertical dark bars. This is the recently described *caeruleopunctatus* Parker, and it appears to be confined to the northern and western Haud; Neumann's (1905, p. 393) record of a red specimen from Modjo (Western Ogaden) might be based on this form, and not, as Boulenger suggests (1921, p. 28) on an erythristic individual. In the original description of *caeruleopunctata* it was stated that it occurred side by side with *longicaudata* and so the two could not be regarded as subspecies. This statement was incorrect and it is now found that all specimens collected in the area indicated are of the red form but there is somewhat more variability in colour pattern than was originally described.

The distribution of the various races along the boundaries and adjacent territories of British Somaliland and the material examined is as follows:

1. Latastia longicaudata longicaudata (Reuss)

♂	11°9′N x 49°E	200 ft.	26.XI.23
♀	11°5′N x 49°E	600 ft.	23.XI.29
juv.	Between Hargeisa & Borama		X.32
♂	10°N x 43°E	1300 ft.	15.VI.34
♀	10°30′N x 42°40′E	3500 ft.	22.III.33
2 ♂ ♂, ♀	10°30′N x 42°45′E	3500 ft.	28.V–6.VII.33
juv., ♀	11°N x 43°E	1500 ft.	19.XII.33
♂	11°15′N x 43°15′E	500 ft.	28.I.34

2. Latastia longicaudata revoili (Vaillant)

2 ♂ ♂, 5 ♀ ♀	10°5′–10°50′N x 49°E	2375–3300 ft.
♂	9°14′N x 48°30′E	2200 ft.
6 ♂ ♂, 5 ♀ ♀	8°20′–9°N x 48°5′–48°43′E	1400–1800 ft.
3 ♂ ♂, 3 ♀ ♀	8°–8°10 N x 48°–48°10′E	2000–2500 ft.

3. Latastia longicaudata doriai (Bedriaga)

♀	9°50′N x 43°20′E	5000 ft.	22.XII.32
2 ♂ ♂, ♀, juv. ♂	9°50′N x 43°10′E	5000 ft.	24XII.32 8–12.V.33 5.VI.33
♂, ♀	9°55′N x 43°10′E	4500 ft.	27.VIII.–2.IX.34
♂, ♀	9°55′N x 43°05′E	4500 ft.	26.I.33
♀	10°N x 43°E	4500 ft.	2.X.33
♀	10°20′N x 42°50′E	3500 ft.	29.VII.33
♀	10°30′N x 42°40′E	3500 ft.	25..III.33

4. Latastia longicaudata caeruleopunctata (Parker)

♂	8°30′N x 46°25′E	2400 ft.	18.II.32
5 ♂ ♂, 10 ♀ ♀	8°15′N x 46°20′E	2100 ft.	26.I.32 30.III.32
♀	8°N x 45°50′E	2500 ft.	26.XI.34
2 juvs.	8°34′N x 45°18′E	2900 ft.	17.VI.32
6 ♂ ♂, ♀	7°20′N x 45°15′E	2100 ft.	23.XI.34
♂, ♀	8°37′N x 45°09′E	3050 ft.	26.VI.32
3 ♂ ♂, 2 ♀ ♀	8°42′N x 44°54′E	3300 ft.	12.XII.34
♀	8°24′N x 44°E	3500 ft.	20.XII.34
2 ♂ ♂, 2 ♀ ♀	8°10′N x 43°40′E	3000 ft.	20.XII.34
♀	8°13′N x 43°30′E	3500 ft.	24.XII.34
2 ♀ ♀, 2 juvs.	Bohodle	2100 ft.	12.III.32

Latastia carinata (Peters)

Lacerta carinata Peters, 1874, Mon. Ak. Berlin, p. 368, pl. fig. 1.
? *Latastia ventralis* Werner, 1917, Mitt. Zool. Mus. Hamburg, **34**, p. 32.

This species, originally described from a single specimen from Brava, Italian Somaliland, has since been recorded from the type-locality and from Berbera (Boulenger, 1921, p. 32), from the Danakil depression near Zeila, and from near Jaldessa (Tornier, 1905 and Neumann, 1905). *Latastia ventralis* based on a single specimen obtained by Hildebrandt, who also collected the type of *carinata,* is possibly a synonym.

Latastia boscai Bedriaga
(fig. 4)

Latastia boscai Bedriaga, 1884, Ann. Mus. Genova, **20**, p. 322.
Latastia burii Boulenger, 1907, Ann. Mag. Nat. Hist. (7), **19**, p. 393.
Latastia wachei Werner, 1913, Jahrb. Hamb. Wiss. Anst., **30**, p. 16.

Boulenger, (1921, p. 22) and the author (1932, p. 355) in discussing this species have referred to two very different colour-phases; but there appears to have been confusion of at least two distinct forms, one of which probably represents a distinct species (see *Latastia taylori* sp.n.). The larger series now available throws considerable light on the problem and also on the status of *Latastia wachei* Werner and *Latastia burii* Boulenger. The whole of the material can be subdivided into the following groups:

1. LATASTIA BOSCAI BOSCAI Bedriaga

3 ♂ ♂, 2 ♀ ♀	43°25′E x 9°50′N	5000 ft.	5.xi.32–16.i.33
♂, ♀	43°20′E x 9°50′N	5000 ft.	20.–21.xii.33
2 ♂ ♂, ♀	43°10′E x 9°55′N	5500 ft.	8.1.–5.v.33
2 ♀ ♀	43°05′E x 9°55′N	4500 ft.	31.–1.2.ii.33
♂, 2 ♀ ♀	43°E x 10°N	1500 ft.	19.xii.33
♂	43°10′E x 10°10′N	5000 ft.	6.ii.33
3 ♂ ♂, ♀	42°50′E x 10°10′N	4500 ft.	6.13.–viii.33
2 ♂ ♂, ♀ (preg.)	42°40′E x 10°30′N	3500 ft.	20.–24.iii.33
♂, ♀	43°15′E x 11°15′N	1000 ft.	31.i.–5.ii.33

This series from the Ogo and the Guban, not far from the type-localities of *L. wachei* Werner, has keeled or tectiform dorsal scales arranged in from 36 to 48 rows across the body and from 8 to 11 femoral pores. The dorsum usually has 5 dark brown longitudinal lines of which the outermost are the broadest, and these and the median dorsal almost always extend onto the tail; the other two dorsals are frequently indistinct or broken up posteriorly. The flanks are black with three longitudinal rows of white ocellar spots, the uppermost series commencing behind the eye and the middle series below the eye on the lip. The lowermost, which is often indistinct, runs from axilla to groin. These lateral spots tend to form longitudinal lines but there is frequently a tendency for them to form vertical bars also. The pattern varies considerably in intensity and in three examples is so reduced that the dorsum is uniform grey and the flanks are only relieved by faint traces of white spots.

This series certainly represents the form to which the name *wachei* (from Hara and Diredawa) was given, but the range of morphological variation is sufficiently great to include both *boscai* (from Eritrea) and *burii* from near Berbera. The differences in the colour pattern between *boscai* and *wachei* do not seem to be sufficiently marked to warrant their retention as separate races, but in *burii* the ocellar lateral spots are completely fused to form two white longitudinal lines and the

outermost two dorsal dark lines are reduced to short streaks just behind the parietals. A short series of specimens from the north-east of British Somaliland resembles *burii* except that the degree of development of the outer dorsal stripes is variable and they may be quite as extensive as in typical *boscai*. Accordingly *burii* cannot be regarded as more than a race of *boscai* and the following have been examined:

2. Latastia boscai burii Boulenger

2 ♂ ♂	400 ft. near Berbera	Types.
♂, ♀	1300 ft. Beretableh, Nogal Valley	7.iv.30.
♂	1400 ft. Nogal Valley, 8°43′N x 48°43′E	6.iv.30.
♂	1000 ft. Al Mado Mts., 11°3′N x 40°47′E	20.xii.29.

Dorsal scales keeled or tectiform, in 40 to 45 series across the middle of the body; femoral pores 10–14.

The last four specimens are those referred by the author (1932, p. 355) to *L. boscai* as series A. In the same paper a number of other uniformly coloured specimens were referred to the same species as series B. Of these 8 were considered to be immature, but it seems probable that this was incorrect and that they represent a distinct, smaller species, *L. taylori*. The two originally considered adult (specs. n & o) appear to represent a southern race of *boscai* which may be known as:

3. Latastia boscai arenicola subspec. nov.

Latastia boscae Boulenger, 1912, Ann. Mus. Genova, (3), **5**, p. 330; idem, 1921, Mon. Lacertidae, **2**, p. 22 (part).

L. boscai Parker, 1932, Proc. Zool. Soc. London, p. 355 (part).

♂, ♀	Haud, 1900 ft., 7°55′N x 47°50′E	11.v.30.
♂	Haud, 2100 ft., 8°15′N x 46°20′E	4.3.–9.iv.32.
♂	Ado, 2100 ft., 7°20′N x 45°15′E	26.xi.34.
♀	Dolo, Italian Somaliland, Coll. Citerni.	

These specimens are the co-types. The race has the head shields and proportions of the typical form, but has somewhat smaller dorsal scales, which are in 45 to 48 series at the middle of the body and are tectiform or keeled; femoral pores vary from 10 to 12. The colour pattern is very different from that of normal individuals of either the typical subspecies, or of *burii*. The dorsum is reddish brown, with, at most, the merest traces of longitudinal stripes, which instead of being darker than the background are a very pale blue, and the flanks and sides of the head are marked with regular narrow vertical bars of

black and white; these markings vary in their intensity and may be almost completely absent or indicated by a dusky, dorso-lateral smudge. Specimens such as these can hardly be distinguished from occasional examples of the typical form such as have been mentioned above, but where the colour pattern is fully developed the two are markedly different.

The name indicates that this southern subspecies inhabits a zone of sandy country with thick scrub, whereas both the northern races are found in stony or rocky localities. This difference of habitat probably accounts for another morphological difference; in *arenicola* the claws are very long and acutely pointed, whereas in the other races from the rocky or stony areas the claws are only about half as long and are comparatively blunt. The colour differences are closely paralleled by the conditions found in *L. longicaudata.* In both species the race found in the Haud and Ogaden is distinctly reddish and dark dorsal markings are absent or replaced by light ones. The specimens taken in May were found in copula.

Latastia taylori spec. nov.

(fig. 4)

Latastia boscai (part) Parker, 1932, Proc. Zool. Soc. London, p. 355 (specs. e–m).

Holotype a male, number 1931.7.20.337, in the British Museum, from the Buran Valley, 2500 ft. (10°20′N x 49°E); collected by Capt. R. H. R. Taylor, 17.x.1929.

Head flat, depressed, once and three quarters as long as broad, its depth a little less than the distance between the tip of the snout and the anterior corner of the eye, and its length contained 4.25 times in the length from snout to vent. Nostril pierced between four shields; upper nasals forming a suture half the length of the fronto-nasal which is a little broader than long and broader than the internarial space; prefrontals forming a median suture shorter than that between the nasals; frontal not grooved, a little longer than its distance from the rostral, once and two thirds as long as broad; interparietal not quite twice as long as broad, in contact with an occipital half its length; 4 supraoculars, the first divided into two, second and third large and subequal, fourth very small; a row of granules separating the supraoculars from the 5 supraciliaries. Lower eyelid scaly, translucent. Rostral not entering the nostril; two superposed post-nasals, the lower in contact with the first and second labials; anterior loreal half as long

as the second; five or six labials anterior to the subocular, which is much narrowed on the lip and separated by two scales from the posterior loreal; lateral edge of the parietal bordered by 3 elongate, narrow scales, of which the anterior is much the longest; anterior margin of the ear bordered by 3 or 4 scales of which the uppermost is the largest. Four pairs of chin-shields, the first 3 in contact and the last the largest; 31 gular scales between the chin-shields and the collar which has about nine scales on its edge, the median very large and the laterals grading into the granules of the neck. Dorsal scales oval, or subhexagonal, flat and smooth, in 39 series across the middle of the body and in 105 series between the occipital and the base of the tail (vertically over the vent); twenty-two in a transverse series between the hind limbs. Ventrals in six longitudinal series, with straight posterior borders, the two median series much narrower than the others; no group of small pectorals; twenty-five transverse series of ventrals; one very large preanal bordering the vent, preceded by another, but much smaller, shield. A series of enlarged plates beneath the fore-arm; upper tibial scales small, imbricate, keeled; ten or eleven femoral pores on each side; subdigital lamellae strongly bicarinate 26 beneath the fourth toe. Caudal scales in equal whorls, oblique and strongly keeled above, smooth beneath. Tip of the fourth toe reaching to midway between the arm and the ear.

Pale reddish brown above and on the tail, faintly marbled with grey anteriorly and on the head; flanks anteriorly and side of the neck with very irregular brown and greyish-white vertical marblings. Lower surfaces uniform white.

Length from snout to vent	43 mm.
Fore-limb	13 mm.
Hind-limb	26 mm.
Tail (regenerated in part)	87 mm.

The following specimens are paratypes of this species:

1931.7.20.339	♀	2000 ft.	10°15′N x 49°E	13.I.1930
1931.7.20.338	♀	20 ft.	11°14′N x 49°E	3.XII.1929
1931.7.20.340–342	3 ♂ ♂	2000 ft.	9°40′N x 49°E [Ex. Field Mus.]	8.II.1930
1931 7.20. 335–336	♂, ♀	3100–3300 ft.	10°13′N x 48°46′E	8.I.1930

This series shows the following variations from the holotype: The head may be once and two thirds as long as broad, and its depth equal to the distance from the snout to the eye; supraciliaries 5 to 7; one or two scales between the posterior loreal and the subocular; 5 or 6

labials anterior to the subocular; dorsals in 36 to 41 series across the middle of the body; ventrals in 23 to 26 transverse series; gular scales 28 to 32; plates in the collar 5 to 7; femoral pores 9 to 12; subdigital lamellae beneath the fourth toes 24 to 27. The fourth toe extends to some point between the shoulder and the middle of the neck. The colour is usually olive, almost uniform, but with traces of lighter marblings anteriorly and on the sides of the neck and anterior part of the flanks, the latter having a tendency towards the formation of vertical bars. The subcaudal scales are smooth proximally, but keeled distally and an unregenerated tail is a little more than twice as long as the distance from snout to vent.

These specimens were originally believed to be all immature, but a female of 42 mm. from snout to vent is pregnant and the species appears to be consistently smaller than *boscai*. It is closely allied to the latter but may be distinguished by its broader, flatter dorsal scales, the absence of a frontal groove and different colour; it appears to be restricted to the north-eastern districts of Somaliland from the Sol Haud to the coast, an area close to that in which the strongly striped *L. boscai burii* also occurs (fig. 4).

Philochortus

I. Usually no granules between the supraoculars and the frontal; dorsal and lateral scales in 28–46 rows at the middle of the body; 10–16 enlarged scales between the hind-limbs.

A. Parietals in contact, the interparietal small or absent, not reaching the occipital. Scales usually smooth. Colour pattern of six white lines, the median two bifurcating on the nape. . . *P. spinalis*

B. Parietals separated by the interparietal and occipital which are in contact. Scales keeled. Colour pattern of six white lines, the median two bifurcating on the nape. . . . *P. intermedius intermedius*

C. Parietals usually separated by the interparietal and occipital, rarely in contact; scales smooth or obtusely keeled. Colour pattern of five white lines, the median bifurcating on the nape. . . . . *P. phillipsi*

II. Usually a more or less complete ring of granules between the supraoculars and the frontal; dorsal and lateral scales in 22–28 (?30) rows at the middle of the body; keeled; 6–8 enlarged scales between the hind-limbs. Colour pattern of five white lines, the median bifurcating on the nape . . . . *P. hardeggeri*

1. Philochortus spinalis (Peters)

Lacerta spinalis Peters, 1874, Mon. Ak. Berlin, p. 369, pl. fig. 2.
Latastia spinalis Tornier, 1905, Zool. Jahrb., Syst., **23**, p. 375.

2 ♂ ♂ Guban 42°40′E x 10°30′N, 3500 ft.

Previously this species has only once been recorded from British Somaliland (Tornier, loc. cit.). also from the Guban, close to Zeilah; otherwise it is Eritrean and Ethiopian in distribution[1] only.

2. Philochortus intermedius intermedius Boulenger

Philochortus intermedius Boulenger, 1917, Proc. Zoöl. Soc. London, p. 152, pl. ii, figs. 2 & 3.
Latastia hardeggeri (non Steindachner) Boulenger, 1898, Ann. Mag. Nat. Hist., (7), **2**, p. 130; Anderson, 1901, Proc. Zool. Soc. London, 2, p. 145 (part).

2 ♂ ♂ Borama District 43°10′E x 9°55′N, 4500–5500 ft.
3 ♂ ♂, 2 ♀ ♀ Borama District 43°E x 10°05′–10°10′N, 5000 ft.

This series agrees closely with the types of the species from the mountains inland from Berbera. The species is an inhabitant of stony mountainous territory in the north and appears to range along the coastal mountains as far as Berbera where it also enters the Guban; it may also enter the Eastern Haud (see below) and extends southwards to the lower Juba (Calabresi, 1927), but is replaced in the Lake Rudolf area by a closely allied subspecies.

Philochortus intermedius subspec.?

♂ Haud, 45°38′E x 8°28′N, 2500 ft.

This single specimen (Parker, 1932) is referred to the species *intermedius* on account of the number of keeled scales at mid-body, and between the hind-limbs, the absence of granules between frontal and supraoculars and the presence of an interparietal in contact with the occipital granule. But there is no colour pattern of white lines to clinch the specific status and there are notable differences from *intermedius*. It seems probable, however, in view of the large numbers of other lizards which are racially differentiated in the Haud, that this also is a local race of *intermedius*. It has a typical Haud colour of rufous brown, dotted with black and is remarkable among the species of *Philochortus* for its very strongly keeled scales.

[1]Boulenger, 1909, Ann. Mus. Geneva, (3), **4**, p. 310 records a "*Latastia spinalis* Peters" from Bardera, Ital. Somaliland. This record is not repeated or quoted elsewhere in the Monograph of the Lacertidae and is probably an error; *Philochortus intermedius* is the only species of the genus known from Italian Somaliland.

3. Philochortus phillipsi (Boulenger)

Latastia phillipsi Boulenger, 1898, Ann. Nag. Nat. Hist., (7), **2**, p. 131.
Philochortus hardeggeri taylori Parker, 1932, Proc. Zool. Soc. London, p. 354.
? *Philochortus intermedius* Scortecci, 1931, Atti Soc. Ital. Sci. Nat., **70**, p. 145.

Comparison of the large series of *Philochortus hardeggeri*, mentioned below, with the co-type series of *P. hardeggeri taylori* Parker, and the two cotypes of *P. phillipsi* Boulenger seems to indicate that the two latter cannot be distinguished. *P. phillipsi* occurs together with *hardeggeri* in the region of Berbera so that the two cannot be regarded as subspecies. In morphological characters *phillipsi* is scarcely distinguishable from *intermedius*, but it has the 5-lined pattern of *hardeggeri;* the specimen determined as *intermedius* by Scortecci (loc. cit. supra) came from El Donfar (49°04′E x 10°30′N) which is considerably beyond the known north-eastern limits of typical *intermedius*, but very close to the area from which *P. hardeggeri* was described and is probably therefore referable to *phillipsi*.

The species ranges from Berbera eastwards to Migiurtina and southwards into the Sol Haud, Nogal Valley and eastern Haud. In the first and last of these localities it overlaps the range of *intermedius* and the two may ultimately be found to intergrade.

4. Philochortus hardeggeri (Steindachner)

Latastia hardeggeri Steindachner, 1891, Ann. Mus. Wien, **6**, p. 371, pl. xi.
Eremias heterolepis Boettger, 1893, Zool. Anz., pp. 115, 193.
Latastia carinata (non Peters) Meek, 1897, Field Columb. Mus., Zool. (1), **8**, p. 181.
Latastia degeni Boulenger, 1903, Ann. Mag. Nat. Hist. (7), **11**, p. 55.

juv. ♀ Burao, 3500 ft.
7 ♂ ♂ Haud, 2100–2700 ft., 45°29′–46°20′E x 8°30′–8°15′N
♀ Ogo, 3500 ft., 42°50′E x 10°20′N.

The last-mentioned female is almost topotypical for the species and agrees well with the adult co-type especially in having the series of granules between the supraoculars and the frontal incomplete. In the series from the Haud and Burao, however, these granules always form a complete series and like many other lizards from that region, differ in a much lighter, rufous-brown colouration. If it should prove possible and desirable to recognise a distinct race the name *heterolepis*, type locality Lafarug, might be available; the type certainly has a complete circle of granules.

The species, which seems to frequent sandy country, ranges along

the coastal mountains from the Danakil depression to Berbera and into the western Haud. Tornier (1905) and Neumann (1905) also record it from the coastal plain near Zeilah.

GERRHOSAURIDAE[1]

Gerrhosaurus

I. Ventral scales in 8 longitudinal series; dorsum between the dorso-lateral light lines, uniformly coloured . . . . *G. flavigularis*

II. Ventral scales in 10 longitudinal series; dorsum dark brown or black with regular longitudinal series of yellow flocks . . . . *G. major bottegoi*

Gerrhosaurus flavigularis Wiegmann

Gerrhosaurus flavigularis Wiegmann, 1828, Isis, p. 379.

This species has not actually been recorded from British Somaliland. It is, however, a wide-spread species and has been recorded from Harrar (Tornier, 1905; Neumann, 1905) so that its presence in the country and especially in the western mountains is to be expected. Loveridge (1937) classes it as a creature of the coastal plains and upland savannahs.

Gerrhosaurus major bottegoi del Prato

Gerrhosaurus bottegoi del Prato, 1895, Atti Soc. Ital. Sci. Nat., **35**, p. 19, fig.
G. major zechi Tornier, 1901, Arch. Naturg., **67**, p. 74.

3 Ads. Borama District 42°45′–43°E x 10°10′–10°20′N 5000 ft.

These specimens appear to be indistinguishable in morphological character from *G. major*, but have the coloration of *bottegoi*, of which *zechi* Tornier appears, as suggested by Schmidt (1919, p. 519) to be a synonym.[2] According to the material, admittedly rather scanty, in the British Museum, there are 3 recognisable races of *G. major*, as follows:

I. Uniform brownish above, or with only irregular dark markings; tail with alternating darker and lighter annuli. This form is confined to Kenya Colony, Zanzibar and northeastern Tanganyika Territory and is the typical form. *G. major major* Duméril.

[1]Written prior to the revision of this family in Bull. Mus. Comp. Zoöl. ,**89**, pp 483-543, which Mr. Parker, being engaged in war work, has not had the opportunity of seeing. A. L.

[2]Schmidt's (1919, p. 519) distinction between *bottegoi* and *grandis* of the yellow dorsal spots being between the scales in the former but on the scales in the latter, is not tenable. They are between the scales even in the type of *grandis*.

II. Black above, with longitudinal series of yellow spots between the dorsal scales; a more or less distinct yellow dorsolateral stripe; flanks brown with longitudinal light flecks forming regular series. Head black above with small yellow spots. This is a northern Sudanese subspecies, ranging from the Gold Coast to Eritrea and Somaliland. It enters the Savannahs of the Congo around Garamba (Schmidt, 1919, loc. cit.), Uganda (Kyagwe and Kaiso) and probably northeastern Kenya (? U.S.N.M. 42216 recorded by Loveridge, 1929, p. 66). In British Somaliland it appears to be confined to the mountains from the Borama district as far east as the Golis Range: *G. major bottegoi* del Prato.

III. Similar in colour posteriorly to the preceding, but anteriorly the light markings are more extensive, obliterating the darker colour and the whole of the upper surface of the head is pale brown, uniform or with small black or chocolate-brown spots. This race occurs in Zululand, Transvaal, Mozambique and Tanganyika Territory and should apparently be known as *G. major grandis* Boul.

It seems very probable that all records of *zechi* from the latter area (e.g. Cott, 1934, p. 165; Loveridge, 1933, p. 311) really refer to *grandis* whilst records of *zechi* and *major* from the northern area are based on specimens of *bottegoi*. The specimen from southern Italian Somaliland (Villagio Duca degli Abruzzi) recorded by Scortecci (1931, p. 146) may well, to judge from the description, be intermediate between the northern *bottegoi* and typical *major*.

CHAMAELEONTIDAE

Chamaeleon

I. Casque strongly raised posteriorly, with a strong, median, parietal crest; no occipital dermal lobes . . . . *C. basiliscus*

II. Casque scarcely raised posteriorly, almost flat above, with but a feeble parietal crest. Well developed, movable, occipital lobes present . . . . *C. dilepis ruspolii*

These are the only two true chamaeleons which have been recorded from British Somaliland. But a number of other species, such as *C. gracilis*, *C. senegalensis*, *C. affinis* and *C. bitaeniatus* are known from Ethiopia and Italian Somaliland and some of these may ultimately

prove to occur there. *C. affinis* has been recorded from the Harrar region (Tornier, 1905; Neumann, 1905) and may be expected in the mountains of the Ogo.

1. Chamaeleon basiliscus Cope

Chamaeleon basiliscus Cope, 1868, Proc. Acad. Philad., p. 316.

♂, 3 ♀ ♀ along the boundary between 43°10′E x 9°55′N and 42°40′E x 10°35′N at altitudes of from 3000–5500 ft.

This is a species with an "Eremian" distribution which enters the protectorate in the coastal zone and mountains as far east as Dagah Shabell (SS.E. of Berbera).

2. Chamaeleon dilepis ruspolii Boettger

Chamaeleon ruspolii Boettger, 1893, Zool. Anz., p. 116.

3 ♂ ♂, 4 ♀ ♀, 5 juvs. from the Haud, between 45°43′E x 8°26′N and 44°44′E x 8°45′N, at altitudes of from 2350–3500 ft.

The status and distribution of the various races of *Chamaeleon dilepis* still present an unsolved problem. Loveridge (1936, p. 330) recognised only three races in eastern Africa, and finds considerable difficulty in accounting for the distribution of some of these; this difficulty may be, in part, due to the fact that some of his races are really composites. Certainly the series of chamaeleons listed above appears to represent a race distinct enough from the typical form to deserve subspecific recognition. As Boettger (1893, p. 116) pointed out in describing *ruspolii* from the Ogaden, the most characteristic feature is the very large size of the scales on the head and particularly on the occipital lobes. This character also appears in certain specimens found in the highlands of Nyasaland (*isabellinus* Günther) and this subsequently led Boettger to place his *ruspolii* as a synonym of the latter. But the two are apparently quite distinct, for the northern specimens differ from *isabellinus* and from any other examples of *dilepis* examined by the author, in their very feebly developed gular-ventral crest. This is composed of scales a little larger than those found elsewhere on the lower surfaces, but does not form the usual pendant crest and is quite indistinct posteriorly.

This race is apparently confined to the northern part of the Ogaden and Haud, and has not been recorded from the mountains or the coastal plain. Specimens collected to the south of the Haud, in the Jubaland-Tanaland area have small head scales and a prominent gular-ventral crest.

RHAMPHOLEON KERSTENI ROBECCHII Boulenger

Chamaeleo kerstenii Peters, 1868, Mem. Ak. Berlin, p. 449.
Rhampholeon robecchii. Boulenger, 1891, Ann. Mus. Genova, (2), **12**, p. 13, pl. i, fig. 3.
Rhampholeon mandera Meek, 1897, Field Columbian Mus., Zool., **1**, 8, p. 183.

2 ♂ ♂, 10 ♀ ♀ from various localities along the boundary in the Haud and Ogo between 46°20′E x 8°15′N and 43°E x 10°N at altitudes of from 2100 to 4500 ft.

Loveridge (1933, p. 329) has shown that bicuspid or simple claws and spinose or smooth scales on the soles of the feet can no longer be used to distinguish the genera *Brookesia* and *Rhampholeon.* But his suppression of the latter genus in consequence may, perhaps, be premature. Werner, in his account of these two genera in "Das Tierreich" mentions a number of osteological characters which also may be diagnostic but which Loveridge has not taken into account. Examination of the skeletons of the type species of *Brookesia* (*superciliaris*) and of *Rhampholeon* (*spectrum*) shows some profound osteological differences. (1) In *B. superciliaris* the nasal is large and unpaired and the vertebrae are modified in a unique manner. The zygapophyses, are carried on processes projecting laterally from the centrum, these processes being unconnected only on the first two cervicals. From the last (third) cervical backwards almost to the end of the tail (the last four excepted) a longitudinal arcade connects the two, enclosing a foramen between itself and the centrum; this arcade from the third dorsal backwards is apposed to the skin and its lateral face is heavily tuberculated. In addition dorsals 3 to 12 inclusive have a process ascending and curving backwards and inwards from the prezygapophysis, meeting and fusing with its fellow of the opposite side and connected by a median longitudinal bar with the tip of the neural spine, so that the whole centrum is enclosed within a basket-like framework (fig. 8). The first 7 of these peculiar dorsals (i.e. 3 to 9 inclusive) have a strong spine projecting laterally from the prezygapophysis and penetrating the skin, the spines becoming weaker caudad and in the most posterior sometimes being absent from one side or the other; a similar spine is developed on the sacrum which consists of two vertebrae more or less fused. On the caudal vertebrae the lateral arcade is broadened ventrally so as to come almost or quite into contact with the tip of the transverse process. (2) In *Rhampholeon spectrum* on the other hand the nasals are very small and paired whilst the vertebrae are of the normal saurian type without any of the excrescences of *Brookesia superciliaris.*

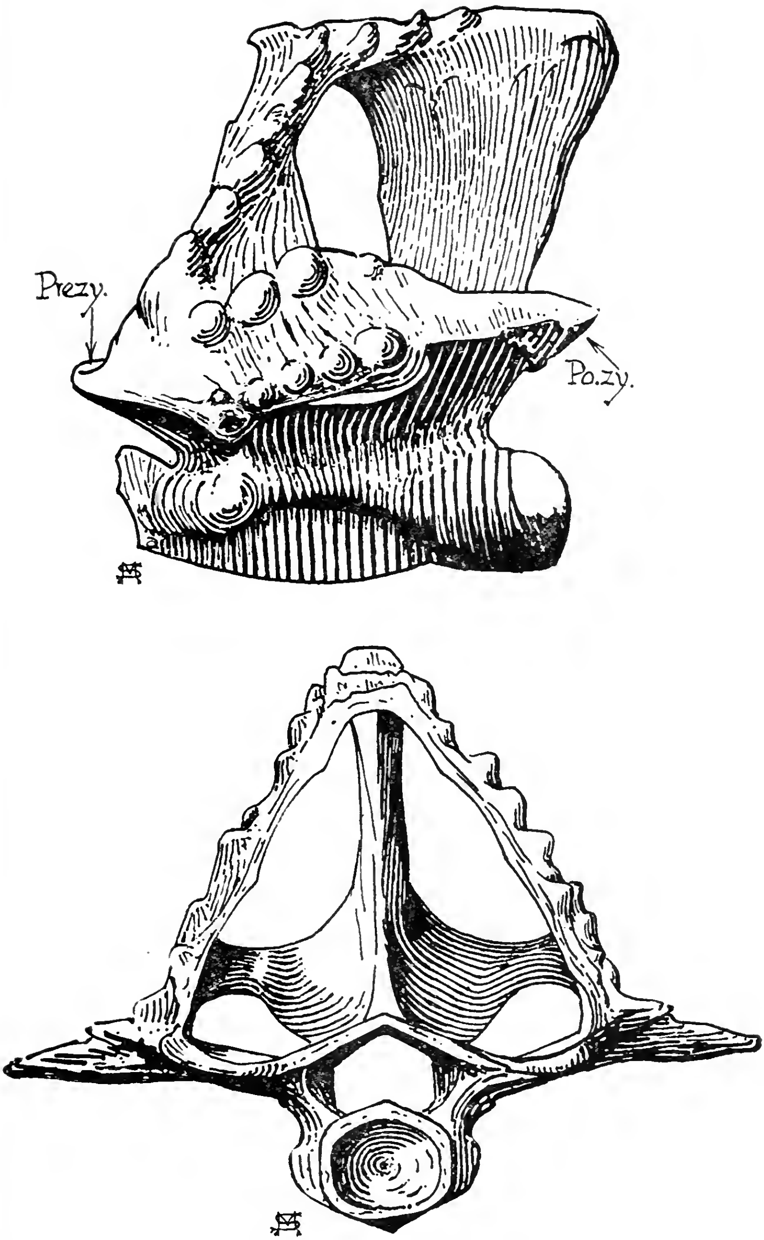

Fig. 8. Dorsal vertebrae of *Brookesia superciliaris*, seen from the side and front.

Prezy. = prezygapophysis; po.zy. = postzygapophysis.

Sufficient osteological material is not available to the author to determine whether the various species of *Brookesia* and *Rhampholeon* fall into two categories corresponding to the foregoing, but there seems to be a reasonable probability that they do. Thus all the continental species (*spectrum, temporalis, platyceps, kersteni, marshalli, brevicaudatus* and *boulengeri*) have the nasals small and paired, or absent, whilst there is no trace of the vertebral basket-like work. On the other hand the Malagasy species *superciliaris, stumpffi* and *ebenaui* have large unpaired nasals and vertebrae similar to those described above; *B. dentata* which has vertebral spines projecting through the skin may be presumed to belong to this group also.

But the remaining Madagascar species (*nasus, minima, tuberculata* and *betsileana*) have no such spines and have, moreover, smooth scales on the soles of the feet, characters in which they agree rather with the type of *Rhampholeon*.

In British Somaliland this small, grass-frequenting chamaeleon appears to be confined to the districts south of the coastal mountains which it does not cross. To the south of the country it is wide-spread through the Ogaden and is replaced in Kenya Colony by the typical form; where the transition takes place has not been determined.

A peculiar and unexplained feature of this species is the preponderance of females over males in collections; this may indicate that the sexes have different habits or habitats.

SCINCIDAE

Ablepharus wahlbergii (Smith)

Cryptoblepharus wahlbergii A. Smith, 1849, Ill. Zool. S. Afr., Rept., App. p. 10.

1 Ad. 42°50′E x 10°20′N 3500 ft.

Curiously enough this appears to be the first record of this common, wide-spread species from British Somaliland, though it has been reported from the Harrar region (Tornier, 1905; Neumann, 1905), from the southern districts of Italian Somaliland and from the latter country close to the eastern border of the British protectorate, near 49°04′E x 10°30′N (Scortecci, 1931). Loveridge (1937) classes it as a species found in the coastal plains and upland savannahs in Kenya, but since it has been reported up to altitudes of 2900 metres in Abyssinia (Tornier, 1905; Neumann, 1905) as well as from the barren, stony Darror Valley (El Donfar) it must obviously be an animal of very wide tolerances.

Chalcides ocellatus (Forskål)

Lacerta ocellata Forskål, 1775, Desc. Anim., p. 13.
Chalcides ocellatus var. ragazzii Boulenger, 1890, Ann. Mag. Nat. Hist., (6), **5**, p. 444.
Lygosoma akeleyi Meek, 1897, Field Columbian Mus., Zool. Ser., **1**, 8, p. 181.
Chalicides bottegi Boulenger, 1898, Ann. Mus. Genova, (2), **18**, p. 719, pl. x, fig. 1.

30 specimens from various localities along the boundary northwards and westwards from 43°20′E x 9°50′N, to the sea and around Zeilah, at altitudes of from 0 to 5500 ft.

Scortecci (1928, p. 324) in discussing the variation of this species in Eritrea arrives at the conclusion that until sufficient material is available for a thorough and complete re-examination of the whole species it is impossible to recognise any distinct sub-species in the eastern part of its range. His remarks apply with equal force to the present series, for the species appears to have a vertical range of 7000 feet from sea level and the various "varieties" bear no apparent relation to distribution. A curious fact of its general distribution in Somaliland is its abundance in the coastal mountain and littoral zones and its apparent absence from the interior and especially from the Haud. This is probably to be correlated with the presence or absence of water for Flower (1933, p. 789) notes that in Egypt the lizard is widely distributed wherever there is water, though this need not necessarily be fresh or perennial.

Mabuya

I. Subocular either excluded from the edge of the lip or so much narrowed that its lower margin is less than half the upper.

A. Two or three long, lanceolate scales on the anterior margin of the ear; first supraocular in contact with or narrowly separated from the frontal. A mid-dorsal and a pair of dorso-lateral light lines; three large dark spots in a longitudinal row behind the ear. Scales tricarinate in 30 to 34 series at the middle of the body .... *M.hildebrandtii*

B. Ear-lobules, if present, short; first supraocular well separated from the frontal; a pair of broad, dorso-lateral stripes but no median dorsal; a dark lateral band from the eye to the groin. Scales usually tricarinate, sometimes 5–7 carinate, in 32 to 40 series at the middle of the body.............................. *M.striata*

II. Subocular bordering the lip, not narrowed appreciably inferiorly, so that its lower margin is always more than half as long as the upper.

A. Scales on the soles smooth, but with one to three terminal spines; subdigital lamellae with a strong median keel and sometimes with traces of additional lateral keels; dorsal scales bicarinate, laterals tricarinate, in 30 to 34 rows at the middle of the body........ .... *M.brevicollis*

B. Scales on the soles without keels or terminal spines; subdigital lamellae smooth or obtusely keeled. Dorsal scales tri- or quinque-carinate.

a. Scales in 25–32 rows at mid-body. A broad, light dorso-lateral stripe, but no mid-dorsal stripe...... *M.planifrons*

b. Scales in 32 to 46 rows at mid-body. Juveniles with 5 light stripes, one being median; in adults these stripes are lost and the whole dorsum is almost uniform................ .... *M.quinquetaeniata*

In addition to the above species Mocquard (1888, p. 111) has recorded *Euprepes* (= *Mabuya*) *comorensis* from Somaliland, but this may be erroneous. Mocquard was reporting upon collections from Zanzibar and Somaliland and there is internal evidence in the paper that confusion of the localities did occur; for instance on p. 111 *Coronella olivacea* is recorded as from Somaliland, but on p. 28 it is definitely stated that the single specimen of this species collected came from Zanzibar.

1. Mabuya hildebrandtii (Peters)

Euprepes hildebrandtii Peters, 1874, Mem. Ak. Berlin, p. 372, pl. fig. 4.—*Mabuya varia hildebrandtii* Scortecci, 1929, Atti Soc. Ital. Sci. Nat., **68**, p. 257; Calabresi, 1927, Atti Soc. Ital. Sci. Nat., **66**, p. 30.

The exact status of this form and its presence in British Somaliland are both uncertain. Loveridge (1923, Proc. Zool. Soc. London, p. 859 and 1929, p. 73) has expressed the opinion that *hildebrandtii* is a synonym of *varia*, but Scortecci (loc. cit supra) prefers to use the name subspecifically. The two are certainly very similar and Scortecci's view may be the correct one; all records of *hildebrandtii* are from between the route from Obbia to Berbera (Boulenger, 1891) and the Jubaland region,—Lugh (Boulenger, 1896c) Brava (idem, 1896b) and Goscia (Scortecci, 1929); *M. varia* has not been recorded within this area except by Calabresi (1927, p. 30) who was following Loveridge

in nomenclature, but whose specimens agreed with *hildebrandtii*. Boettger (1893), however, records both species from the Webi (Shebeli) Valley, and so, for the time being, it seems advisable to continue to recognise *hildebrandtii* as a distinct species. It may be regarded as a derivative of *M. varia* with particularly long auricular lobules, a modification which appears to have taken place independently in the superficially very similar *M. damarana* (Peters) of Angola and S. W. Africa. Boulenger's (1891) record indicates the possibility of its occurrence in eastern British Somaliland.

2. Mabuya striata (Peters)

Tropidolepisma striatum Peters, 1844, Mem. Ak. Berlin, p. 36.
Mabuya varia (non Peters) Meek, 1897, Field Columbian Mus., Zoöl., **1**, 8, p. 181.

14 specimens along the boundary in the Haud between 46°25′E and 43°10′E, at altitudes of 2100–4250 ft.

3 specimens from Burao, 3500 ft.

5 specimens from the Borama District, 4500–5000 ft.

This common, widely-distributed skink appears to be arboreal in most districts and this habit may explain its comparative rarity in the coastal plain from which it has only been recorded once and that on rather unreliable authority (Meek, loc. cit.).

3. Mabuya varia (Peters)

Euprepes varius Peters, 1867, Mem. Ak. Berlin, p. 20.

1 specimen from the Haud between 44°24′–44°44′E and 8°45′–8°52′N, 3500 ft.–3800 ft.

16 specimens from the Borama district between 42°50′–43°15′E and 9°50′–10°15′N, 4000–5400 ft.

In the north of its range this wide-spread species appears to be rather a montane form; it has not been recorded from the coastal plain; it is rare in the Haud and is replaced in the low-lying districts of the eastern Ogaden and Italian Somaliland by *M. hildebrandtii* (q.v.). This apparent preference does not hold, however, in territories further to the south for Loveridge (1937) records it as a species of the coastal zone, upland savannahs, the grassy uplands and alpine meadows.

The single specimen from the Haud is aberrant in the possession of only 28 scale-rows, a character only once previously recorded by

Loveridge (1936a, p. 317) in a specimen from Gongoni, Kenya Colony. Females collected in the Borama district in September were pregnant, but as Loveridge (loc. cit) records females in this condition in Kenya Colony in December, March and April, the breeding season appears to be extended.

4. Mabuya brevicollis (Wiegmann)

Euprepes brevicollis Wiegmann, 1837, Arch. Naturg., p. 133.
Mabuya somalica Calabresi, 1915, Mon. Zool. Ital., **26**, p. 242.

10 specimens from the boundary in the Haud between 46°25′ and 45°09′E, 2100–3050 ft.

1 juv. Ado, Ogaden, 45°15′E x 7°20′N, 2100 ft.

♂, ♀, juv. along the boundary between 42°50′E x 10°20′N and 42°45′ E x 10°45′N, 2000–3500 ft.

Loveridge's suggestion that *somalica* is a northern race of *planifrons* appears highly improbable, for *somalica* with 32 scalerows, bi- or tricarinate dorsal scales, and a dorsal pattern of transverse dark zones beset with white spots is quite unlike *planifrons* which seldom has more than 30 scale rows, has tri- or quinque-carinate scales, and well-marked dorso-lateral light stripes as its salient characters. Instead *somalica* has so many features in common with *brevicollis* that it is impossible to avoid the conclusion that they are synonyms. The only morphological differences between the two, to judge from existing descriptions, appear to lie in the number of supraoculars in contact with the frontal and the condition of the subdigital lamellae. In the present series the first of these characters is found to be very variable; in six specimens the third supraocular touches the frontal, in four these two scales are separated and in one both conditions occur. The subdigital lamellae of *brevicollis* are described as smooth, those of *somalica* as unicarinate; actually they are unicarinate in *brevicollis* too, as pointed out by Boulenger (1896b, p. 19) although in older individuals they may become smooth through wear, so that this character also falls to the ground. There remains only colour, which is sufficiently variable in *brevicollis* to include the described condition of *somalica*. The white spots, so characteristic of the very young tend to persist in transverse bands, more particularly in males than in females, but are almost completely lost in the largest individuals (over 150 mm. from snout to vent) of both sexes.

The juvenile taken in July measures only 36 mm. from snout to vent and was, apparently, but newly hatched. The species was found

in dead trees and under piles of stones, and is widely distributed in all parts of the protectorate. It ranges from the coastal plain and upland savannahs of Kenya Colony and Tanganyika Territory (Loveridge, 1937) northwards to Eritrea and southeastern Arabia.

5. Mabuya planifrons (Peters)

Euprepes planifrons Peters, 1878, Mem. Ak. Berlin, p. 203, pl. ii, fig. 3.

1 Bohodle, in the Haud, 46°20'E x 8°15'N, 2100 ft.
2 Borama district, 5000 ft.
1 Ado, 45°15'E x 7°20'N, 2100 ft.

This species appears to be absent from the coastal plain but to be distributed throughout the rest of the protectorate from which it ranges southwards in the coastal plains and upland savannahs to Tanganyika Territory and westwards through the mountains of Abyssinia.

6. Mabuya quinquetaeniata quinquetaeniata (Lichtenstein)

Scincus quinquetaeniatus Lichtenstein, 1823, Verz. Double. Mus. Berlin, p. 103.
Mabuya semicollaris Werner, 1917, Mitt. Zool. Mus. Hamburg, **34**, p. 33.

8 ♂ ♂, 4 ♀ ♀, 2 juvs.	Borama Distr., 4000–5000 ft.
4 ♀ ♀	42°40'E x 10°30'N, 3500 ft.
2 ♂ ♂	43°E x 11'N, 1500 ft.

This species appears to be confined to the mountains as far east as Berbera, but has not been recorded from the Haud or any part of the area south of the mountains. These skinks from British Somaliland agree closely with the typical *quinquetaeniata* from Egypt in possessing 32–38 scales at mid-body, the pre-frontals almost always (88 percent) in contact to form a distinct suture and the throat of the male heavily mottled with black; this is in marked contrast to the immaculate-throated race of *obsti* of the countries south of Uganda and Kenya. As is often the case, the mountains seem to have been subject to invasion from the north and west and the present species provides further evidence of this. *M. quinquetaeniata* has almost a complete circum-rainforest distribution and extends northwards along the Nile Valley to Lower Egypt; but although it is common in northern Uganda, Kenya and Abyssinia, it appears to be completely absent from the Ogaden and Italian Somaliland. Unless the species formerly had a continuous distribution and has only recently become exterminated in this region, the population of the montane region in British Somaliland

must have been derived from the north-west and it is with examples from this area that the Somali population shows the closest affinity. Flower (1933, p. 758) concludes that the evidence of its distribution in Egypt "points to its being a tropical African form which has entered Egypt by the Nile and is still extending its distribution when oppotunity offers".

Riopa

I. Snout not depressed; fronto-nasal in contact with the rostral; nostril between the supra-nasal and two small nasals. Scales in 24–26 rows . . . . *R. producta* Boul.

II. Snout depressed, wedge-shaped; rostral separated from the fronto-nasal.

A. Nostril between three shields. Two superposed preoculars . . . . *R. sundevallii* Smith

B. Nostril between two shields (i.e. the anterior and supra-nasals fused). Two superposed preoculars.

1. Four labials anterior to the subocular; frontal very narrow posteriorly; dorsal scales of juveniles tricarinate . . . . *R. laeviceps* Peters

2. Three labials anterior to the subocular; frontal broader; dorsal scales smooth . . . . *R. modesta somalica*

C. Nostril in a single nasal; a single preocular . *R. vinciguerrae* Parker

Riopa sundevalii (Smith)

Eumeces (Riopa) sundevallii Smith, 1849, Ill. Zool. S. Africa, Rept., Appendix, p. 11.

Lygosoma ferrandii Boulenger, 1898, Ann. Mus. Genova, (2), **18**, p. 718 pl. ix, fig. 2.

Ad. Haud, 4000 ft., 44°15′E x 8°55′N 28.ix.32.
Ad. Borama Distr., 5000 ft., 43°10′E x 9°55′N 9.v.33.

These two specimens have 24 scale-rows which appears to be the normal condition in British Somaliland and the surrounding territories (Parker, 1932, p. 359); but it seems doubtful whether the use of trinomials is justifiable to distinguish a subspecies in this area.

Riopa laeviceps (Peters)

(fig. 9)

Euprepes (Tiliqua) laeviceps Peters, 1874, Mem. Ak. Berlin, p. 371, pl. fig. 3.

9	specs.	Haud	2100 ft.	46°20′E x 8°15′N	10.ii.–30.iii.32.
2	"	"	2200 ft.	46°10′E x 8°15′N	8.iv.32.
1	"	"	3100 ft.	45°04′E x 8°39′N	14.vii.32.
1	"	"	2300 ft.	45°58′E x 8°21′N	11.viii.32.
2	"	"	2250 ft.	46°04′E x 8°19′N	12.viii.32.
3	"	"	2200 ft.	46°09′E x 8°17′N	12.viii.32.
2	"	Ado	2100 ft.	45°15′E x 7°20′N	23–26.xi.34.

These 20 specimens, compared with other specimens collected in the mountains of northern Somaliland, show conclusively that Boulenger (1896, p. 20) was wrong in uniting *laeviceps* and *modesta* and the author (1932, p. 360) was equally at fault in regarding the former as a northern

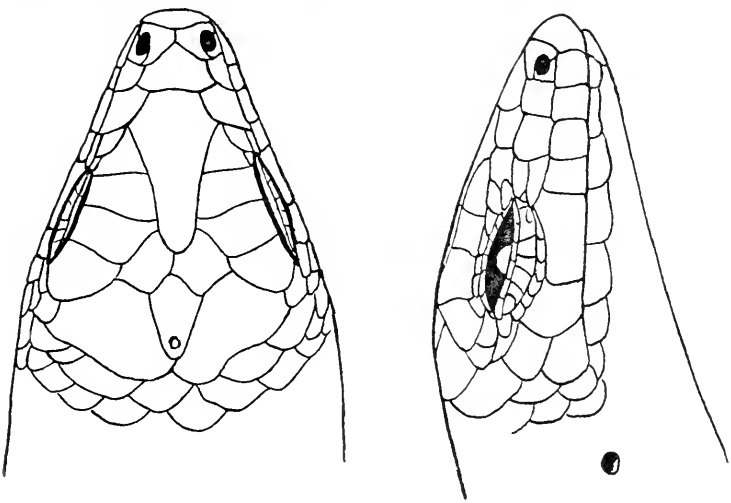

Fig. 9. Head scales of *Riopa laeviceps* Peters. Adult measuring 80 mm. from snout to vent.

race of *modesta;* the above series, which agrees admirably with Peters's description of *laeviceps*, represents a distinct species which is recognizable by its longer, less depressed snout, larger fronto-nasal, much longer and narrower frontal, the presence of 4, instead of 3, labials anterior to the sub-ocular, and the tricarinate scales in the young. The head shields are very constant in all the specimens examined, and the differences in proportions are readily appreciable by a comparison of the accompanying figures (figs. 9 & 10).

The series shows little variation and the original description is adequate in most respects. There may, however, be 26 or 28 scales at the middle of the body, and the dorsals are tricarinate only in juveniles.

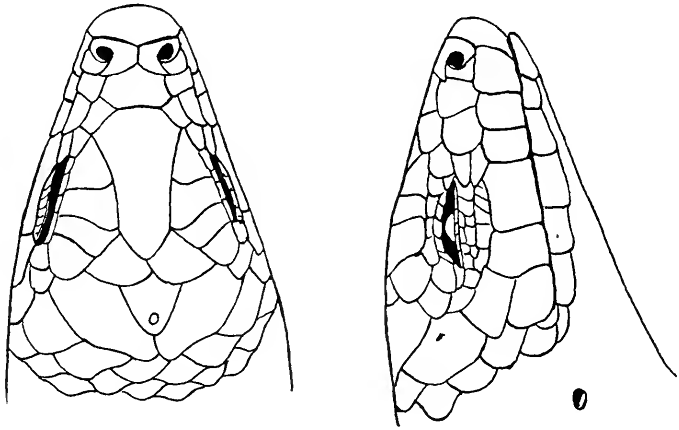

Fig. 10. Head scales of *Riopa modesta somalica* Parker. Cotype 1937.12.5.747, measuring 65 mm. from snout to vent, drawn to the same scale as Fig. 9.

The largest specimen measures 83 mm. from snout to vent and 3 females collected at the end of March have each two embryos in an advanced state of development. The species is cryptozoic, being found under logs and stones or in termites nests by day.

Riopa modesta somalica subspec. nov.

(Fig. 10)

Lygosoma modestum Boulenger, 1895, Proc. Zool. Soc. London, p. 535; idem, 1895, Ann. Mag. Nat. Hist., (6), **16**, p. 168.

Lygosoma modestum laeviceps (non Peters) Parker, 1932, Proc. Zool. Soc. London, pp. 358, 360.

As pointed out above, the name *laeviceps* Peters is not available for the northern form of *modesta*, and a new one appears to be necessary; the name *sphenopiforme* is, apparently, based on an aberrant specimen of typical, southern *modesta*. The northern race is represented in the British Museum and the Muséum d'Histoire Naturelle, Paris, by the following specimens which are the co-types of the name *somalica:*

1937.12.5.746.	Juv. 4500 ft. 42°50′E x 10°10′N 6.viii.33.	Capt. Taylor
1937.12.5.747.	Ad. 5500 ft. 43°E x 10°05′N 29.viii.32.	Capt. Taylor
95.6.14.25–26.	Ad. & juv. Inland of Berbera	Lort-Phillips
1905.10.30.97–98.	2 Ads. Near Berbera	Bury
1905.11.7.30–31.	Ad. & juv. Wagga (3—4000 ft.) Golis Mts.	Bury
Mus. Paris 1918.5.	Ad. Near Berbera	Bury

To judge from this material the subspecies is confined to the mountains and possibly also the littoral zone in British Somaliland, whereas the typical form occurs in central, eastern and northern Tanganyika Territory, eastern Kenya and southern Italian Somaliland.[1] Whether the two meet and intergrade in the intervening territory is uncertain but appears unlikely as this region is occupied by *Riopa laeviceps*. Since, however, the differences between the northern and southern forms, though clear, are slight they are ranked only as subspecies until further material is forthcoming.

Head shields as in *Riopa modesta* except that the frontal is constantly as long as or a little longer, instead of shorter, than the fronto-parietals and parietals together, and in 1937. (juvenile) the prefrontals and posterior loreals are fused; scales smooth, in 26 or 28 rows at mid-body; limbs slightly longer than in the typical form, the posterior contained 3.4 to 4.6 times in the length from snout to vent; outer toe much longer, with 7—9 (vice 5—6) subdigital lamellae, extending as far, or nearly as far, as the second. Largest adult 85 mm. from snout to vent. Juveniles pale brown, spotted with darker brown above, the spots forming longitudinal series, and with a broad, white-spotted, dark, lateral band. With increasing age these markings become less defined and the adult is pale brown with dark spotting on the head and indefinite small lighter and darker spots dorsally. Lower surfaces uniform white.

Riopa vinciguerrae (Parker)

17 specs.	Haud 2100 ft.	46°20′E x 8°15′N	26.i.–31.iii.32.
3 specs.	Haud 2400 ft.	46°25′E x 8°30′N	17.ii.32.
1 spec.	Haud 2300 ft.	45°58′E x 8°21′N	10.viii.32.
2 specs.	Haud 2200 ft.	46°09′E x 8°17′N	13.viii.32.
1 spec.	Haud 2100 ft.	46°19′E x 8°14′N	17.viii.32.
1 spec.	Haud 2400 ft.	45°49′E x 8°24′N	26.viii.32.
1 spec.	Ado 2100 ft.	45°15′E x 7°20′N	23.xi.34.

[1]Boulenger, 1895c records "*Lygosoma modestum*" from Sheik Hussein (40°50′E x 7°45′N), in Eastern Abyssinia adjacent to the Ogaden. Possibly it is in this region, to the west of the area occupied by *R. laeviceps*, that the two subspecies of *R. modesta* meet.

This large series shows no appreciable differences from the types, though there may be 22 to 24 scales around the middle of the body. A common abnormality is the fusion of the prefrontals and posterior loreals which occurs on both sides in 8 specimens and on one side only in 3, 15 being normal. The species appears to range over the whole of the Haud and Ogaden regions from 8°30″N in the north, to Lugh in the south.

APPENDIX

By Capt. R. H. R. Taylor, O.B.E.

A. *Topographical Information*

The 'Horn of Africa' (of which British Somaliland is a part) may be divided into three distinct tracts of country:

(1) The fringe of maritime plain between the mountains and the sea.

(2) The maritime mountains running almost parallel to the coast and often intersected by inland plains.

(3) The raised plateau to the south with subsidiary hills lining the water drainage.

British Somaliland is further divided by the Somals into the following areas, which have distinctive natural features.

(a) The maritime plain and maritime mountains, known as the Guban. The maritime plain stretches inland from Zeila to a depth of 60 miles but soon narrows to an average depth of 7 or 8 miles by Bulhar and Berbera. Thence to the Italian frontier it extends rarely more than 2 miles inland. Generally speaking the plain is sandy with a scanty vegetation of a stunted character. Evergreen bushes, however, are frequently seen growing on the banks of the dry river beds which intersect the plain on their way to the coast. A certain amount of grass is to be found in the Zeila plain away from the coast.

The maritime hills south and west of the Zeila plain are a confused mass of low table-topped plateaux of black trap rock, with tufts of grass and occasional bushes growing between the thickly strewn boulders. South of Bulhar the hills are of greater height and are broken up into a number of parallel limestone ridges. They are bare, stony and precipitous, and are cut by deep and narrow river gorges. These gorges are thickly tree'd with thorn. Within the ranges and between them and the northern edge of the interior plateau are undulating plains, intersected by broad sand-rivers running between alluvial banks and a jungle of thick thorn. Between the rivers are

occasional patches of grass but the ground is usually of a gravelly and stony nature supporting a few thorn trees.

East of Berbera the maritime ranges merge into one another, retaining however the same character. Some distance beyond, they combine with the northern crest of the interior plateau to form an irregular range, 145 miles long, of limestone hills, which limit the maritime plain to a breadth varying from 200 yards to 2 miles.

(b) The northern crest bounding the interior plateau runs from Beyu Anod in a south-south-easterly direction to Hargeisa, whence it strikes in a north-easterly direction under the names of the Asa and Golis ranges. It is then broken by the Huguf plain, and afterwards runs slightly north of east to the Italian frontier.

From Beyu Anod, 2000 feet, the crest rises rapidly and as far as the mountains west of Hargeisa the average height is about 5000 feet. On the northern slopes grow cedar, box, accacia and euphorbia.

Near Hargeisa the crest is lower and the northern slope which is of a terraced nature, affords good pasturage and is known as the Ogo Guban.

From the Ogo Guban of Hargeisa, the crest rises gradually through the Asa, 3000 to 4500 feet, to the Golis range, 6000 to 7000 feet. After a break in the crest by the Huguf plain, the Golis reappears as the Warsangli mountains which form a uniform ridge some 6000 to 7000 feet high, although near Erigavo they ascend to nearly 8000 feet to form the Surud Ad mountains. The Warsangli and Golis mountains have a steep northern face which in places is formed by a series of precipitous steps. Cedar and box are to be found on the higher slopes and the whole is thickly covered with vegetation.

(c) The southern slope of the northern crest bounding the interior plateau consists of a strip from 10 to 30 miles in width of grassy downs or thorn covered wilderness. The slopes are usually gentle. The central part of this strip running across British Somaliland is known as the Ogo.

(d) That portion of the Daror valley (in the north-east of the country) which lies in British Somaliland, is of an arid nature and the surface for a great part consists of anhydrite beds (gypsum).

(e) The Nogal valley is formed by the junction of two main affluents, the northernmost rising in the Golis range and the southernmost in the southern slopes of Bur Dab. The valleys of these affluents afford good pasturage and are studded with thorn bush scrub. As the valleys widen, the bush becomes more sparse although good pasturage is still afforded for some distance after the junction of the two affluents.

Near the Italian frontier, the valley is arid and the surface instead of being of a limestone formation is of anhydrite beds (gypsum).

(f) The Haud may be said to be that part of the interior plateau running south of east from the line Jijiga-Jifu Meider to a line joining the geographical co-ordinates L 49°E x 8°N and L 45°E x 6°N, and bounded on its northern side by the Nogal valley and on its southern by the Jerer and Fafan rivers. The area is undulating and is waterless in the dry season with the exception of a few scattered wells. The ground falls evenly from NW to SE, from 5500 feet between Jijiga and Jifu Meider to 400 feet at Galadi. The surface is either a red clay or red sandy soil and occasional outcrops of limestone rock occur. The red colour of the soil is a distinct feature of the area and it is particularly noticeable in the central portion. The type and density of the vegetation varies considerably throughout the area, from impenetrable thorn jungle, to sparse thorn scrub with an undergrowth of aloes, to open grass plains. The bush in the south-eastern half of the Haud is, on the whole, thicker than that in the north-western half where the grassy plains appear more often and are larger in size. Along the boundary with Italian East Africa where this passes through the Haud, it is noticeable that the dominant bushes and trees tend to be lower in height east of about L 45°E x 8°40′N than the dominants west of that point.

(g) The area between the Daror and Nogal valleys, known as the Sol Haud, is uniformly level and at about 3000 feet above sea level. Its vegetation is similar to that existing on the Haud.

B. *Climatic Information*

There are four main seasons in British Somaliland.

(1) The dry season (Jilal) which lasts from November to March. During this period there is practically no rain. The north-east monsoon blows during this period but is generally a mild wind. The nights are comparatively cold up country and the days, even on the coastal plains, not excessively hot. Several degrees of frost have been recorded on the frontier north-east of Jijiga.

(2) April is a hot and sultry month. The principal rainy season during the year occurs during May and June. These rains are known as the "Ju".

(3) The "Ju" rains are succeeded by the south-west monsoon, the wind being called locally the "Kharif". The "Kharif" generally blows from the beginning of June to the beginning of September. It is a strong wind and raises dust storms in any area where there is little

vegetation; it is particularly bad in the coastal area. The period when this wind blows is the hot season and is called by the Somals "Haga".

(4) October is a hot and sultry month like April, and the "Dair" rains fall about this time. These rains are very variable, sometimes there is a fairly good rainfall and at other times only one or two showers.

Rainfall: The rainfall in the country is very local and for that reason it generally happens that there is great variation in local conditions as to grazing, rainpools, etc. Also it does not behave in a strictly regular manner from year to year. Sometimes the rains start early and sometimes late. Some years they are heavier and in others very considerably less than the average. This will be noticed on an examination of the table of rainfalls at several stations over a period of years which is given below.

Year	*Berbera*	*Burao*	*Sheikh*	*Hargeisa*	*Zeila*	*Borama*	*Erigavo*
	ins.	ins.	ins.	ins.	ins.	ins.	ins.
1919	2.31	—	—	—	—	—	—
1920	2.29	—	—	—	—	—	—
1921	1.35	3.85	—	—	—	—	—
1922	0.79	—	16.64	15.28	—	—	—
1923	2.86	9.90	47.14	16.86	—	—	—
1924	0.98	8.96	23.51	18.06	0.56	—	—
1925	0.56	11.89	20.59	16.39	2.04	23.24	12.62
1926	6.54	12.30	27.38	31.91	10.81	27.79	18.34
1927	2.02	9.78	11.70	14.58	8.42	19.79	15.29
1928	1.09	9.07	19.90	12.45	3.08	15.99	10.50
1929	0.37	9.25	25.04	17.07	1.81	16.42	11.90
1930	4.63	6.50	27.02	20.67	8.83	22.55	12.84
1931	1.43	9.79	19.43	25.35	0.66	20.24	10.53
1932	2.20	5.58	18.79	15.28	8.12	25.99	11.07
1933	0.86	5.58	17.07	12.42	2.05	15.90	9.81
1934	1.70	5.67	18.17	15.19	5.46	18.37	12.53
1935	6.20	7.26	16.58	18.26	3.29	25.99	13.53
No. of years rainfall was recorded	17	14	14	14	12	11	11
Average annual rainfall for this period	2.25	8.24	22.07	17.84	4.59	21.12	12.63

Temperature

The record given below of maximum and minimum temperatures at certain stations, shows the conditions that prevail in the different zones in the country.

The figures shown are the mean of the observations of nine years (1925 to 1933 both inclusive). These observations vary little from year to year.

Station	*Mean Maximum* degs. F.	*Mean Minimum* degs. F.	*Absolute Maximum* degs. F.	*Absolute Minimum* degs. F.
Maritime region:				
Berbera	93	78	111	62
Northern edge of the interior plateau: Sheikh	80	56	92	36
Interior plateau:				
Hargeisa	85	57	95	33
Borama	81	56	92	36
Burao	85	63	95	48

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A SUMMARY OF THE IGUANID GENUS *UROSAURUS*

By M. B. Mittleman

With Sixteen Plates

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To

My wife, Mary Elizabeth, to express in a small measure my appreciation of her help and unflagging encouragement.

No. 2. — *A Summary of the Iguanid Genus* UROSAURUS

By M. B. MITTLEMAN

CONTENTS

INTRODUCTION

Among the several peculiarly North American genera of lizards, there remain but few which have not been subjected to an exhaustive monographic treatment. These have chiefly been small groups containing but relatively few species. One of the notable exceptions is the highly ramose genus *Urosaurus* Hallowell, 1854, which in itself is not to be found in current usage.

The present study had its genesis in the summer months of 1938, when I was afforded the opportunity to observe and collect numbers of specimens of the genus *Urosaurus*, in my capacity as herpetologist to the 1938 Rainbow Bridge – Monument Valley Expedition, under the able leadership of Dr. Angus M. Woodbury. The original effort to settle the contentious status of the species native to the Navajo country of northeastern Arizona and southeastern Utah, led to this study.

Many persons have contributed in a very real sense towards the fulfillment of the plan of investigation, and to all of these, grateful and sincere acknowledgment is made. In this connection, particular mention must be made of Dr. Herschel Thomas Gier, of Ohio University, to whom I am indebted for constant interest, support, and many fruitful suggestions. Drs. Leonhard Stejneger, Doris M. Cochran, and Alexander Wetmore, of the United States National Museum, have kindly made the great resources of that institution constantly available to me, and have offered much in the way of help and encouragement. Dr. Thomas Barbour must surely be accorded a more than ordinary word of grateful thanks for his generous help in the publication of this paper, as well as for the loan of very many specimens. Benjamin Shreve and Arthur Loveridge, of the Museum of Comparative Zoölogy; the late Dr. G. Kingsley Noble and Charles M. Bogert, of the American Museum of Natural History; M. Graham Netting, of the Carnegie Museum; Joseph R. Slevin, of the California Academy of Sciences; Dr. Laurence M. Klauber, of the San Diego Society of Natural History; Drs. E. Raymond Hall, Alden H. Miller, and Jean M. Linsdale, of the Museum of Vertebrate Zoölogy; Drs. Henry Fowler and Emmett Reid Dunn, of the Philadelphia Academy of Sciences; Dr. John Hack, of the Peabody Museum; Dr. Angus M. Woodbury, of the University of Utah; Dr. George F. Knowlton, of Brigham Young University; Dr. Karl P. Schmidt and Clifford Pope, of the Field Museum of Natural History; Dr. Howard K. Gloyd, of the Chicago Academy of Sciences; Dr. Raymond B. Cowles, of the University of California at

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Part I. The Taxonomy and Relationships of *UROSAURUS* and its Allies

In 1852, Baird and Girard erected the genus *Uta* for a rather small lizard, prominently characterized by gular folds, auricular openings, and a fine, homogeneous dorsal scalation. Somewhat later in the same year these authors described another new form (1852:126), presumably also referable to the same genus, which was named *Uta ornata*. However, this latter form differed in several respects from the first-named form (*stansburiana*); most noticeable difference being the dorsal scalation, which consisted of rather fine scales everywhere, save along the median line, where they were abruptly enlarged, rather strongly keeled, and prominently imbricate; these enlarged scales were divided into two parallel series on either side of the median line by a series of somewhat smaller, vertebral scales. In 1854, Hallowell encountered another new form, generally similar to Baird and Girard's *Uta ornata*, save that the enlarged dorsals extended the length of the dorsum in a broad, uninterrupted band, lacking the presence of the smaller, dividing series of scales. On the basis of this scalation, Hallowell set up the genus *Urosaurus*. A somewhat similar move was next made by Duméril, who described the genus *Phymatolepis* (1856:548) for a Mexican lizard generally similar to the *Uta ornata*, but possessed of only a single series of enlarged dorsals on either side of the smaller vertebrals. The attempts of Hallowell and Duméril were shortlived, however, for in 1858 Baird described the species *Uta symmetrica*, a close ally of his previously named *Uta ornata*, and in the next year (1859:7) definitely placed Hallowell's *Urosaurus* in the synonymy of *Uta*. And in this synonymous category *Urosaurus* has remained, save for a brief use

as a subgeneric appellation by Van Denburgh (1922:182). Duméril's *Phymatolepis* has fared only slightly better, for Cope soon placed it in synonymy (1864:177), although on at least two occasions thereafter the name was used (Fischer, 1882:232; Boulenger, 1883:342), but was soon relegated to the oblivion of synonymy (Boulenger, 1885:214, 216), where it has since remained.

In addition to these attempts at generic restrictions, one other one was made in the long history of *Uta*. In 1863, Cope described the very distinctive *Uta thalassina*, a rather large iguanid differing in several respects from any previously known members of the then-recognized genus *Uta*. The general habitus of this lizard was sufficiently different from other known forms, so that Boulenger (1885:205) considered it generically distinct, and proposed the generic name *Petrosaurus*. Boulenger's attempt was promptly ignored by Cope (1887:35), who retained *thalassina* in *Uta* as originally described. Van Denburgh has used *Petrosaurus* subgenerically (1922:181), but other than this usage, the name has been considered a trite synonym of *Uta*.

A brief description of *Uta* (*auct.*) follows:

Size small to quite large; auricular openings present; dorsal scalation homogeneous, either keeled or smooth, or else with an abruptly enlarged series of scales along the median line; dorsal scales imbricate or pavemented; caudals greatly enlarged, spinose, heavily keeled, or else very minute, smooth, barely imbricate; ventrals rounded and smooth, or submucronate to mucronate, and keeled; gular fold heavily denticulate, or else with an even margin of small scales; supraoculars in one, two, or three principal rows; postfemoral dermal pocket present, or postfemoral dermal pocket absent; posterior maxillary teeth tricuspid; a sternal fontanelle present; xiphisternal abdominal ribs present; ventrum with or without blue patches in males; a bright blue postaxillary blotch present or absent; dorsal pattern either of short, broken cross bars extending from neck to sacrum, or else with three or four heavy black bars on the anterior portion of back; a distinctive dark neck or shoulder band present or absent.

Accepting such a loose definition of *Uta* makes necessary the inclusion of approximately thirty-seven species and subspecies exhibiting enormous gaps in structure, pattern, size, and distribution. It is exceedingly difficult to conceive of such a heterogeneous assemblage as having arisen from a single, even greatly generalized, primitive ancestor. Even the extremely diverse and multitudinous genus *Sceloporus* does not present as vicarious a group as is now recognized under the single all-encompassing heading of *Uta*.

With quite some comfort, I point out the following statement, ". . . genera are groups for convenience, . . . no two people are ever likely to agree for long on generic limitations . . . any means of breaking up large genera by setting off particularly well differentiated species or groups of species is justifiable. . . ." (Stejneger and Barbour, 1933:vi.) I cannot reconcile myself to the thought that the many forms included in *Uta* are congeneric, and therefore recognize a division of these many forms; a redefinition of *Uta*, revival of *Urosaurus* and *Petrosaurus*, and the erection of a fourth genus, seems to adequately and more logically categorize these animals.

Genus UTA Baird and Girard

1852 *Uta* Baird and Girard, Stansbury's Expl. Surv. Vall. Great Salt Lake, p. 345.[1]

Genotype. stansburiana.

Diagnosis. Small iguanid lizards (maximum size, snout to vent, approximately 75 mm.); prominently denticulated auricular openings and gular folds; dorsal scalation homogeneous, consisting of small, lightly keeled, rounded, imbricate scales; ventrals rounded, smooth, imbricate; caudals greatly enlarged, heavily keeled and spinose, strongly imbricate; supraoculars in one principal series; interparietal (occipital, *auct.*) large; postfemoral dermal pocket present; superciliaries imbricate; labials segmental; no distinctive blue abdominal patches in males; postaxillary and/or preaxillary dark blotches present; dorsal pattern consisting of small, pale maculations, or else principally of larger blotches in parallel series which may or may not be joined to form longitudinal bands; xiphisternal abdominal ribs present; a sternal fontanelle present; posterior maxillary teeth tricuspid.

Distribution. North America, from Texas to Washington and south to the southern portion of Baja California; the islands bordering California and Baja California in the Pacific Ocean and Gulf of California; northern Mexico, as far south as southern Sonora.

Remarks. As defined here, *Uta* includes *stansburiana* and its subspecies, as well as the species *taylori*, *concinna*, *mannophorus*, *martinensis*, *nolascensis*, *palmeri*, *squamata*, and *stellata*.

[1] Concerning the question as to whether this name was published as cited here, or in the Proc. Acad. Nat. Sci. Phila., 1852, 6:69, Dr. Stejneger advises me, "Stansbury's Explorations has the priority of publication. It was 'published early in 1852, probably late March or early April.' The paper in the Proc. Phila. Acad. was *read* on April 27, consequently published considerably later." Contrary-minded are referred to Taylor, 1935:411, *et seq.*

Genus UROSAURUS[1] Hallowell

1854 *Uro-saurus* Hallowell, Proc. Acad. Nat. Sci. Phila., **7**: 92.

Genotype. graciosus.

Diagnosis. Similar in many respects to *Uta*, but differing principally as follows: dorsal scalation not homogeneous, but consisting of minute scales except in the vertebral region, where the scales become abruptly enlarged, usually strongly carinate and imbricate, occasionally spinose; enlarged dorsal scales either separated into two parallel series by a median line of smaller scales, or else extending in a broad band for the length of the dorsum; ventrals often mucronate and keeled, especially laterally; postfemoral dermal pocket variable, regularly present in some forms, variable occasionally, absent in others; males with distinctive blue abdominal patches; no post- or preaxillary blotches; dorsal pattern of short, lateral bars, usually broken on the mid-line, occasionally a pattern aberration of longitudinal stripes; never wholly maculated above with small, light flecks.

Distribution. Texas west to California, and north to Utah; south throughout Baja California; Mexico along the west coast principally, as far south as Chiapas; islands bordering Baja California in the Pacific and Gulf of California; the Revillagigedo Archipelago.

Remarks. As defined here, *Urosaurus* includes the species and subspecies known heretofore as *Uta ornata* and its subspecies, as well as the numerous forms recently treated by myself (1941); also the species *microscutatus* and *nigricaudus*. See pages following for a fuller discussion of the forms of *Urosaurus*.

Genus PETROSAURUS Boulenger

1885 *Petrosaurus* Boulenger, Cat. Liz. Brit. Mus., **2**: 205.

Genotype. Uta thalassina Cope, Proc. Acad. Nat. Sci. Phila., 1863: 104.

Diagnosis. Large iguanid lizards (maximum size, snout to vent, approximating 175 mm. or more); dorsal scalation homogeneous, consisting of small, smooth scales, which are usually pavemented; venter with slightly larger, smooth, pavemented scales; caudals small, weakly keeled, barely imbricate, smaller than ventrals; supraoculars in three

[1] I have followed the example of the Check-List in dropping the hyphen; cf. *Dipsosaurus.*

principal series; gular fold barely or not at all denticulate; supraoculars smooth (rather than rugose), as are the other cephalic scales; postfemoral dermal pockets present; venter lacking distinctive abdominal blotches in males; no pre- or postaxillary blotches; shoulders with three or four heavy transverse blackish bars.

Distribution. The southern portions of Baja California, and a few of the adjacent islands in the Gulf of California.

Remarks. As defined here, *Petrosaurus* includes besides the type species, the form which should properly be known as *Petrosaurus repens* Van Denburgh.

STREPTOSAURUS[1], gen. nov.

Genotype. *Uta mearnsi* Stejneger, Proc. U. S. Nat. Mus., 1894: **17**, 589.

Diagnosis. Medium-sized iguanid lizards (approximating 100 mm., snout to vent), closely related to *Petrosaurus*, and bearing a superficial resemblance to *Uta* also, but distinguished from these two genera as follows: Differs from *Petrosaurus* in the smaller ventrals; the enlarged, strongly keeled, spinose caudals; the presence of two supraocular rows; the lack of a well developed anterior gular fold; the smaller size; the well developed lateral dermal fold; greater number of femoral pores; much larger preauricular spines; the absence of a bold pattern of three or four transverse bars in the scapular region; the presence of a distinctive neck band which is dark, and bordered behind with a lighter hue; the presence of a fairly heavy blue abdominal wash (approximating somewhat the blotches found in *Urosaurus*); and the prominent dorsal peppering of light flecks. Differs from *Uta* in the much smaller smooth and pavemented dorsal and ventral scales; the possession of two principal series of supraoculars; the lack of an anterior gular fold; the lack of denticulation on the gular fold; greater number of femoral pores; cephalic scales smooth, rather than rugose; the presence of a strong neck band of blackish; the absence of any small blotches dispersed in parallel series, or fused to form longitudinal bands; the presence of several well-marked dark crossbands dorsally; the prominent caudal pattern of dark and light rings.

Distribution. Extreme southern California and the adjacent portion

[1] *Streptosaurus* =στρεπτος (wreathed, banded, or twisted) +σχυρα (lizard), in reference to the prominent neck band, or wreath, of this genus.

of Baja California; Angel de la Guardia and Mejia islands, in the Gulf of California.

Remarks. As defined here, *Streptosaurus* includes besides the type species, the form which should be properly known as *Streptosaurus slevini* Van Denburgh.

It is my belief that not only is the genus *Uta* (s.l.) divisible as given in the preceding paragraphs, but that two of the genera, *Petrosaurus* and *Streptosaurus*, are more closely allied to the section of the *Iguanidae* characterized by the genus *Crotaphytus*, than to *Uta* and *Urosaurus*, which are obvious derivatives of the *Sceloporus* stock. I base this assumption on several premises. First, *Uta* and *Urosaurus* are conceivably derivable only from *Sceloporus*, or perhaps some sceloporid form now extinct. Secondly, these two genera are very close to *Sceloporus* in their general habitus, and differ in only a very few points. On the other hand, we find that the general body form and details of structure characteristic of *Petrosaurus* and *Streptosaurus* are most nearly duplicated in *Crotaphytus*, of living genera. The genera *Crotaphytus* and *Petrosaurus* are in fact almost identical on superficial examination; however, they differ in the greatly reduced interparietal of *Crotaphytus*, as well as the very small and numerous supraoculars, and the other reduced and multiplied cephalic scales; they are further distinguished by the presence of palatines in the former genus, and the absence of these in *Petrosaurus*. Sternal fontanelles are apparently variable in *Crotaphytus* (*fide* Cope, 1900:247), but constantly present in *Petrosaurus*. Of the two genera, *Crotaphytus* is probably older in view of its more widespread distribution, and the closer similarity in osteology of this genus with that of primitive groups such as *Dipsosaurus* and *Ctenosaura*. *Streptosaurus* is most closely allied to *Petrosaurus* of living genera, and in the main probably best characterized as a fairly recent derivate. Properly speaking, neither the *Crotaphytus-Petrosaurus-Streptosaurus* stock, nor the *Uta-Urosaurus-Sceloporus* stock can be particularly considered as being either older or more primitive than the other. An accompanying diagram illustrates the probable derivations and positions of these genera amongst North American *Iguanidae*. It will be noticed that I have included several other genera in addition to those discussed above, for the sake of completeness. *Dipsosaurus* is probably the most primitive of the North American *Iguanidae* (excepting *Ctenosaura*, which is properly a Central and South American form), and possesses several points in common with *Ctenosaura*, most easily observed of which is the dorsal crest; the genera further show their relationship in the similarity of the cephalic scutel-

lation which is essentially simple, and shows no particular degree of differentiation. *Sauromalus* is considered a specialized offshoot of the *Crotaphytus*, or more properly, pre-*Crotaphytus* stock, by reason of its solid sternum, as well as the five-lobed teeth; the simple type of cephalic scalation indicates its affinity with the more primitive *Dipsosaurus*-

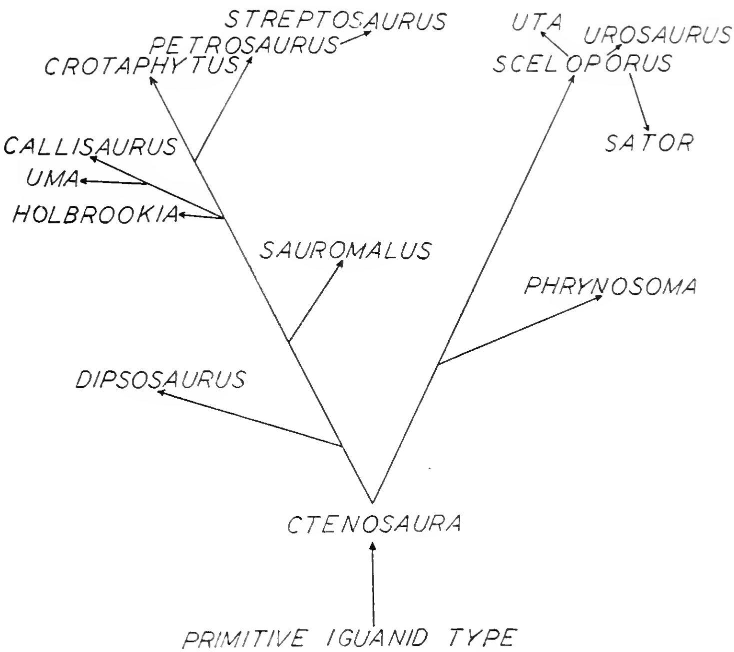

Fig. 1. The phylogeny and relationships of North American iguanid genera.

Ctenosaura stock. The three genera *Uma*, *Callisaurus* and *Holbrookia* form a compact group, presumably derived within comparatively recent times from a *Crotaphytus*-like stock. They resemble each other in the common type of dorsal scalation, and the imbricate superciliaries and supralabials. *Uma* is easily distinguished by reason of the enlarged digital fringes which *Callisaurus* lacks; *Holbrookia* does not possess auricular openings, which are present in the other two genera.

The other branch of the North American *Iguanidae* presents first *Phrynosoma*, a primitive but highly specialized genus, at once distinguishable by the squat and flattened habitus, as well as enormously developed cephalic scalation. Since the relationships of *Uta*, *Urosaurus* and *Sceloporus*, and that of this latter genus and *Sator*, have not been satisfactorily presented previously, I give a brief résumé based on available information.

In 1935, Smith discussed at some lengths the relationships of *Sceloporus* and *Uta* (s.l.), and concluded that the two genera, as then understood, were most nearly allied by *Sceloporus couchii* and *Uta* (= *Urosaurus*) *levis*. Smith later emended this somewhat, and postulated the belief that *Uta* "arose from the forms now extinct which closed the present gap between *couchii* and *merriami*." Shortly thereafter I subscribed to this point of view (1941), and presented further observations on the phylogeny of the Mexican *Urosaurus*. Since that time, further investigation of *Uta*, *Urosaurus*, and *Sceloporus* shows that these premises are only partly true.

Uta is considered as very nearly allied to *Urosaurus*, as indicated by the available evidence. Both genera apparently have sprung from an early progenitor which soon diversified sufficiently to produce the bifurcate branches we recognize today as *Uta* and *Urosaurus*. The latter genus is possibly the older of the two, or at least differentiated and spread more rapidly, judging by its more widespread distribution in the outlying Pacific Islands and southern Mexico. It appears that *Uta* probably did not become dispersed or diversified specifically until the beginning of the Miocene, for it is largely restricted to the continental portions of the United States and Mexico, and the adjoining islands, while being absent from some of the older Gulf and Pacific islands which had appeared prior to this time.

The closest relationship between *Uta* and *Urosaurus* occurs between *Uta squamata* and *Urosaurus microscutatus*. In these forms, the genera have apparently produced parallel lines, for *squamata* possesses the largest dorsals in *Uta*, and is fairly large, whereas *microscutatus* is one of the smallest of its genus, and possesses the least development of the dorsals.

As I have pointed out, while *Uta* and *Urosaurus* have doubtless shared a common ancestor if the evolutionary lines be carried back sufficiently, this ancestral type probably differentiated at an early date. Thus, as Smith points out, "in *couchii* . . . dorsal scales are extremely small for the genus, the laterals are minute, and the size of the species itself is small." In addition to these premises which serve to link *Uta*

and *Sceloporus*, it may be said that *stejnegeri*, most primitive of the Utas, and *couchii*, occupy overlapping areas. I would agree with Smith (1939:239) that *Uta* (through the medium of *stejnegeri*) is closer to *couchii* than to any existing *Sceloporus;* however, the derivation has probably taken place through the medium of a pre-*couchii* form, rather than through this latter species. Whether such a form would close the gap between *couchii* and *merriami*, in *Sceloporus*, I cannot say.

Urosaurus apparently most closely approaches *Sceloporus* through the *maculosus* and *merriami* groups of this latter genus, being not particularly closer to one or the other of these groups, but occupying a somewhat intermediate position. Somewhat as in the case of *Uta*, the origin of *Urosaurus* appears to have stemmed from an early precursorial stock which gave rise to the two groups of *Sceloporus*, as well as *Urosaurus*. In the *merriami* and *maculosus* groups are found small Scelopori, with larger dorsals than in *couchii* (and hence more similar to *Urosaurus*), more rugose dorsals than in *couchii;* in addition, the frontals are usually divided transversely, and rarely if ever longitudinally as in *couchii;* postfemoral dermal pockets present in *maculosus*, absent in *merriami* (variable in *Urosaurus*), constant in *couchii* (and also *Uta*). It will be seen therefore that *Uta* and *Urosaurus* may be considered as very nearly biological equivalents, for they are widely distributed, highly prolific, of about the same age, successful (as adjudged by the multiplicity of individuals and species), and derived from closely related progenitors.

The genus *Sator* Dickerson, 1919, is in some respects unique, and because of its relationship with *Sceloporus*, of interest here. Although Dickerson (*op. cit.*) mentioned certain osteological differences supposed to obtain in *Sator*, I have not been able to ascertain any constant osteological variations within the genera *Sator*, *Sceloporus*, *Uta*, and *Urosaurus*. Insofar as I am able to determine, distinguishing features of *Sator* are those of lepidosis and form. Thus, this genus may be recognized by virtue of its vertically compressed body and tail, rudimentary gular folds, poorly differentiated dorsal scales, and the rudimentary postanals in the males. Although some authors have considered *Sator* intermediate between *Uta* and *Urosaurus*, or between the former genus and *Sceloporus*, I am of the opinion that it is actually a direct derivative of the primitive *pyrocephalus* group of *Sceloporus*, and is not closely related to any other known lizards.

The *pyrocephalus* complex includes *pyrocephalus*, *gadoviae*, and *nelsoni*, all three of which exhibit compressed tails to some degree, at least in the males. Further, in these species, the dorsals are reduced;

in one, *gadoviae*, a postfemoral dermal pocket is present (as it is in *Sator*); a high femoral pore count exists; there is only a very gradual transition from the larger dorsals to the smaller laterals; and finally,

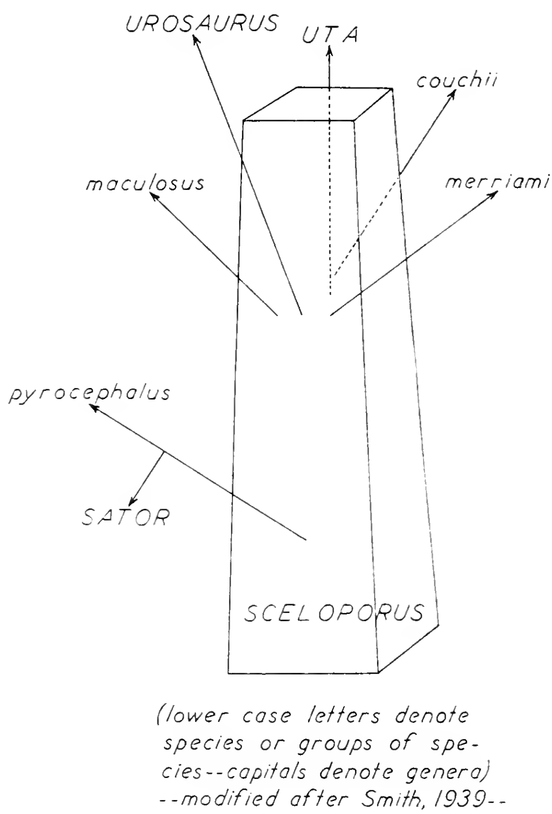

Fig. 2. The derivation and intergeneric relationships of *Urosaurus* and allied iguanid genera.

the postanals of the males are either greatly reduced, or absent. *Sator* closely resembles these lizards in all the characters noted. Finally, *Sator* possesses dark lateral cross-bars on the male abdomen, a pattern

which is reproduced in *S. pyrocephalus*, and in no other known Sceloporid. Dickerson (op. cit.) postulated a close relationship between *Sator* and *Sceloporus utiformis* because of the rudimentary gular fold in this latter species, as well as certain other minor details. I have discussed this point with Dr. H. M. Smith, and we agree that on the whole, the derivation of *Sator* through the medium of the *pyrocephalus* group, seems much more likely. It is probably worthy of note to add that the formation of *Sator* has seemingly been of the most fortuitous nature, and almost certainly due primarily to insular isolation. This fact is borne out by the remarkable ability of the stock which produced *Sator*, to again emulate the same trend, even in a mainland population of *Sceloporus*, where in the relatively isolated *gadoviae* there exists a remarkable parallelism in color, pattern, ecology, and even scutellation to some degree.

PART II. SUMMARY OF THE GENUS *UROSAURUS*

Methodology and Scope of the Study

Approximately 6,500 specimens have been critically examined in the course of investigation of this problem. While ample numbers of some forms have been available, others are but poorly represented in collections. Specimens have often been haphazardly collected when and where opportunities permitted; necessarily therefore, many critical regions are not represented in available series, or else but scantily. The dynamic aspect of the study is thus heightened in view of the many problems which still present themselves. As Dr. E. H. Taylor so aptly termed Mexico, in relation to his study of *Eumeces*, it is the *terra incognita*, and insofar as *Urosaurus* is concerned, it is to this general region that future workers must turn for the answers to many questions.

I have not attempted to present all of the available data on the natural history of the numerous forms in the genus, but rather has the effort been restricted to the taxonomy involved, ecology being for the most part utilized only where it serves to explain problems of isolation, speciation, and kindred matters. It will be observed that each form is treated principally from the viewpoints of taxonomy, structure, and distribution. In essence therefore, this report resolves itself into a collection of taxonomic and other data of practical interest to the laboratory worker principally. Thus, long and detailed synonymies have

been omitted, and only those references which I have considered important to the proper understanding of the form in question have been given.

Herpetological taxonomy has seen several excellent uses of statistics in the study of genera and other natural associations, especially where large numbers of specimens have been available. In view of the multitude of specimens extant for this study, it was at first thought that these would lend themselves admirably to the statistical approach. Unfortunately, extensive measurements, scale counts, and the application of numerous formulae have not borne out this hope. True, mensural limits of variation and proportion have been ascertained for most of the forms, but qualitative data reduced to quantitative terms have proved all but useless. This is chiefly due to the fact that the distinguishing features of most forms are of a qualitative, rather than quantitative nature. Throughout this study, insofar as available specimens permit, populations have been examined, and populational trends have been given the most consideration, with relatively little or no emphasis on the individual. This has been necessitated by extremes in metachrosis, as well as an inordinate variation in individuals, particularly in minor details of scalation.

Throughout its range, *Urosaurus* exhibits a remarkable propensity for the proliferation of local trends, perhaps even unique genic strains. For the most part, these have been the result of the extreme ecological limitation of *Urosaurus*, which will only under the greatest duress leave its vertical habitat of rocks, trees, cliffs, and fences, and traverse the desert floor to a similar, nearby habitat. As a result of this ecological isolation of many populations, genetic involutions attributable to forced inbreeding are the mode, and result in many minor strains which characterize these small groups. The problem then, for the taxonomist, is to decide which of these trends is clearly definable, which population possesses these features to a distinguishing degree, and whether apparent morphological distinction is correlated with definite geographic and/or ecological niches. For the most part, these local trends are negligible other than for their academic interest. But in a few cases, closely related forms are separated (and apparently restricted) by only a scant dozen miles or so of desert floor. Quite possibly because of this marked propensity for isolation and the proliferation of superficial details, authors in the past who have dealt with this genus and have had only small numbers of specimens, or else specimens from widely separated localities, have in despair considered several distinct species synonymous with each other, and thus obscured the true relationships

of several forms, as well as making practical identification a matter of clairvoyance in many instances.

Certain details of structure and proportion have been found to be of prime significance, and are utilized throughout this report in the definitions and diagnoses of the species and subspecies. These are listed and annotated below:

Enlarged dorsal scales (fig. 3). These constitute the most readily observable, and in most instances important feature in nearly every

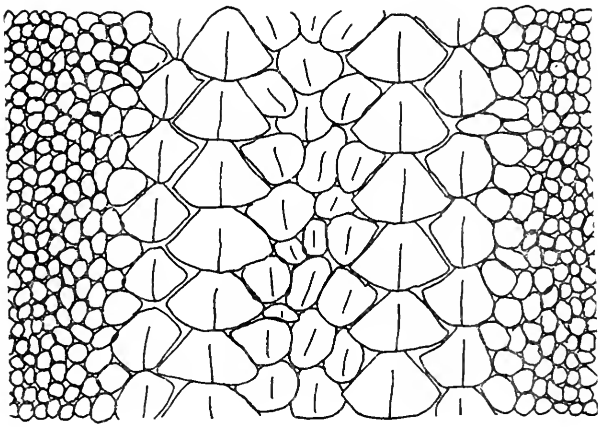

Fig. 3. Details of vertebral, primary, and secondary enlarged scales.

form. Enlarged dorsal scales are of two general types: vertebrals and the larger bordering scales. Thus, in several forms the smaller series of vertebrals extends from the nape to the basal portion of the tail, bordered on either side with a varying degree of constancy, by one or more series of larger scales. In numerous instances, the vertebrals are lacking, so that the enlarged scales are present as a more or less homogeneous band, with the largest scales on the midline, and the remainder progressively decreasing as they extend laterally. When the vertebrals are present the first parallel bordering series of enlarged dorsals is referred to as the "primary series"; if others are present too, they are termed "secondary series". Particular attention is given to the distribution and shape of the enlarged dorsal scales, as, whether

they are evenly dispersed, whether the individual scales are rounded posteriorly, or mucronate, submucronate, spinose, smooth, or carinated. Unless used to the contrary, the term "enlarged dorsals" refers specifically to the series bordering the smaller vertebrals.

Ventral scales. Reference is made in several cases to the structure and dispersal of these, generally in the same terms as those used for the enlarged dorsals.

Dermal folds. These are present in most forms, absent in a few. When present, they usually extend from the cervical region to the groin or further, and are usually on the dorsolateral or lateral line, or both. Since these are sometimes of diagnostic importance, especial attention should be paid to determine whether apparent dermal folds are actually true folds, or simply superficial wrinkles due to preservation.

Postfemoral dermal pocket (fig. 4). This is a slight dermal invagination within the angle formed by the posterior part of the femur and the

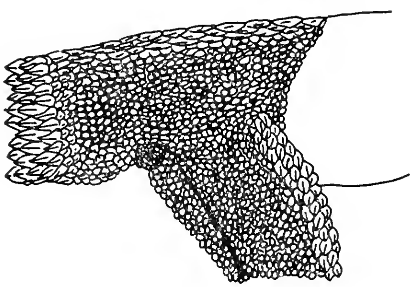

Fig. 4. Location and form of postfemoral dermal pocket.

body. It is lined with scales which are much smaller than those elsewhere on the body. The presence or absence of this structure is used diagnostically, and although variable in some forms, is usually highly constant. When the term "rudimentary" is employed to describe the pocket, it infers that it is represented by a small whorl of scales in a minor depression.

Tubercles. Tuberculation is for the most part referred to in comparative terms, but in a few instances the absence or presence of these modified scales on certain portions of the body is of diagnostic value.

Femoral and tibial enlarged scales (fig. 5). On the anterodorsal surface of the thigh, and in a band of varying width around the tibia, are

dispersed greatly enlarged, heavily keeled, and usually strongly spinose scales. The comparative size of these is often referred to. They are regularly present, save in one species.

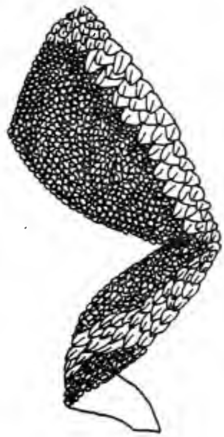

Fig. 5. Enlarged femoral and tibial scales.

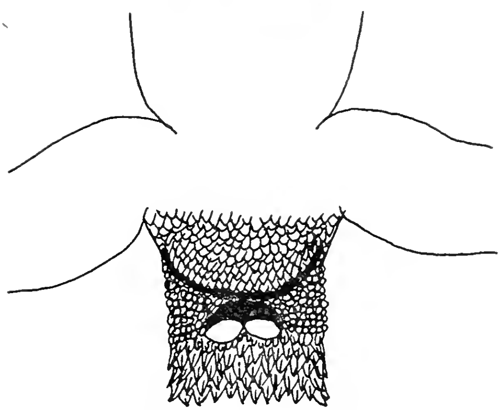

Fig. 6. Enlarged postanal scales of the male.

Enlarged postanal scales (fig. 6). These are characteristic of the males of all known forms, but are subject to a wide variation in size in the several forms. They are usually flat, subcircular, and somewhat depressed.

Caudal scales. In all known forms the caudal scales are greatly enlarged, heavily keeled, strongly spinose, and imbricate; the scales become smaller as they progress laterally and terminally. The type of transition from the dorsal to the lateral caudal scales is important, as are the numbers of scales in each whorl. In several species, the extent to which the vertebrals encroach upon the basal portion of the tail is used diagnostically.

Cephalic scutellation (fig. 7). The following description is typical of the genus: cephalic plates fairly smooth, large; temporal region swollen; nostril above the canthus rostralis; frontal plate variable, transversely divided in some forms, entire in others, occasionally split vertically; a principal series of supraoculars, and immediately next to these another series scarcely smaller; supraoculars separated from frontal, frontoparietals, and parietals by one or two series of small granules; interparietal largest; superciliaries elongated, projecting, strongly imbricate; rostral wider than high; labials segmental; mental variable, in contact with both sub- and infralabials; gular region variable, scales granular or flat, imbricate or pavemented. Other cephalic scales are too variable to be of significance in most cases; occasionally the numbers of prefrontals and frontonasals are diagnostically employed.

Color. But two facts need be mentioned at this time. First, that with no known exception, the lizards of *Urosaurus* are very prone to exhibit a uniformly melanistic appearance. This appears in all known forms, and is often, but not always, correlated with habitat. When melanism occurs, it usually effaces all but the barest traces of pattern. Secondly, all *Urosaurus* males possess brightly colored abdominal blotches, usually of some shade of blue. The extent and intensity of these is used in the diagnosis of some forms. In one case, at least, the females also possess blue abdominal patches, but these are irregularly defined and not so intense as in the males of the species. The usual condition however, presents the female abdomen unicolor, usually grayish or white, and sometimes lightly maculated with a darker pigment in haphazard fashion.

Mensural data. With but a few exceptions, only four measurements are given: head length (tip of snout to posterior border of the auricular opening), head width (usually taken immediately anterior to the meatus auditorius), body length (tip of snout to vent), and hind leg length (measured from the anterior angle of insertion to the tip of the 4th toe, exclusive of the nail). With but a few exceptions, tail lengths are not given, principally because the tail is so often lacking in pre-

served specimens that such a feature would be of little use in many instances. Secondly, for the most part, a gross evaluation of the tail

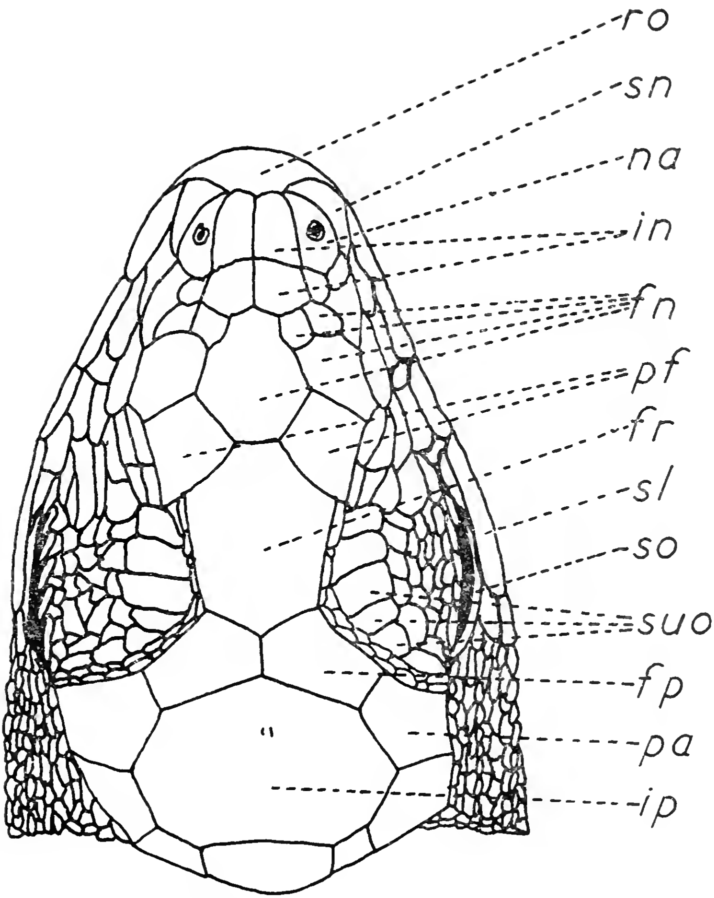

Fig. 7. Cephalic scutellation and nomenclature in *Urosaurus*. *ro*—rostral; *sn*—subnasal; *na*—nasal; *in*—internasal; *fn*—frontonasal; *pf*—prefrontal; *fr*—frontal; *sl*—supralabial; *so*—subocular; *suo*—supraocular; *fp*—frontoparietal; *pa*—parietal; *ip*—interparietal.

length, as, whether it is more than twice the combined head and body length, or less, is all that is needed. All measurements are given in

millimeters. For practically every form, the measurements of a sample of several adults of both sexes (unless specifically stated otherwise), usually fifty or more specimens, are given. In these cases, the weighted arithmetic mean is used for each figure; this "mean" is simply a more accurate representation of the commonly used "average".

The accumulation of large series of data has produced several facts of interest. From a practical viewpoint as regards these lizards, it has been noted that measurements and ratios obtained from them, based on the gross sampling of populations, are often misleading for the reason that such measurements and/or ratios are not constant in an individual, and hence population. Or this is better expressed perhaps, if it is said that these mensural data progress dynamically, and unless a specific age group *and* sex is employed, the results are distorted. Thus, throughout *Urosaurus* innumerable cases of positive and negative heterogony (depending on the organ under consideration) have been observed. Several of these heterogonal changes in size and proportion of age groups of the same and opposite sexes have been found to fit the formula $Y = bX^k$ (Simpson and Roe, 1939:367, *et seq.*). To present as much uniformity as possible, all measurements and ratios obtained from series of specimens have been taken from equal numbers of males and females (unless specifically stated to the contrary), which have been sexually mature animals, as adjudged by the condition of the gonads, or gross size when this has been known to be indicative of sexual maturity.

Genus UROSAURUS Hallowell

1852 *Uta* Baird and Girard, Proc. Acad. Nat. Sci. Phila., **6**, 126; Baird, Proc. Acad. Nat. Sci. Phila., 1858, December, p. 253; Baird, U. S. Mex. Bound. Surv., 1859, **2**, 7; Cope, Rept. U. S. Nat. Mus. 1898 (**1900**): 299; Van Denburgh, Occ. Pap. Calif. Acad. Sci., 1922, **10**, (1), 180; Mittleman, Jour. Wash. Acad. Sci., 1941, **31**, (2), 66.

1854 *Uro-saurus* Hallowell, Proc. Acad. Nat. Sci. Phila., **7**, 92 (type, *Urosaurus graciosus* Hallowell); Van Denburgh, Occ. Pap. Calif. Acad. Sci., 1922, **10**, (**1**), 182 (subgenus).

1856 *Phymatolepis* Duméril, Arch. Mus. Hist. Nat. Paris, **8**, 548 (type, *Phymatolepis bi-carinatus* Duméril); Fischer, Abh. Nat. Ver. Bremen, 1882, **7**, 232; Boulenger, Ann. Mag. Nat. Hist., 1883, **5**, (11), 342 (subgenus).

Diagnosis. Small to medium-sized iguanid lizards with well developed, pentadactyl limbs adapted for climbing and running; digits with

well developed claws; head large with prominent eyes and auricular openings; a strong gular fold, often immediately preceded by one or more additional folds; gular fold and auricular orifices denticulated prominently; interparietal large; superciliaries imbricate; labials segmental; enlarged supraoculars in two principal rows; dorsal scalation homogeneous except in the median region where the scales become enlarged, prominently keeled, and usually imbricate; enlarged dorsals occasionally separated into two or more parallel series by a smaller, vertebral series of irregularly arranged, weakly carinated scales; ventral scales large, imbricate, occasionally spinose and/or carinate; tail long, slender, covered with greatly enlarged, keeled, spinose, imbricate scales; limbs with keeled, imbricate scales of moderate size, except on the antero-dorsal surfaces of the thighs and a narrow band on the tibiae, where the scales become greatly enlarged, and usually mucronate to spinose; lateral and dorsolateral dermal folds usually present, and often with a continuous or broken crest of enlarged tubercles; cervical region similarly with dermal folds and tubercles; males with enlarged postanal plates; post-femoral dermal pockets present in some species, absent in others, occasionally variable; a sternal fontanelle; xiphisternal abdominal ribs present; lateral and/or posterior teeth tricuspid; body and tail depressed; no dark post- or preaxillary blotches; males with prominent blue abdominal patches.

The following nomenclatorial changes are herewith proposed, and the respective species and subspecies recognized as valid:

Urosaurus ornatus ornatus Baird and Girard, 1852.
ornatus graciosus Hallowell, 1854.
ornatus symmetricus Baird, 1858
ornatus schottii Baird, 1858
ornatus linearis Baird, 1859
ornatus levis Stejneger, 1890
ornatus wrighti Schmidt, 1921
ornatus caeruleus Smith, 1935
ornatus schmidti Mittleman, 1940
ornatus chiricahuae Mittleman, 1941
nigricaudus Cope, 1864
auriculatus Cope, 1871
irregularis Fischer, 1882
clarionensis Townsend, 1890
microscutatus Van Denburgh, 1894
gadovi Schmidt, 1921

unicus Mittleman, 1941
bicarinatus bicarinatus Duméril, 1856
bicarinatus tuberculatus Schmidt, 1921
bicarinatus nelsoni Schmidt, 1921
bicarinatus anonymorphus Mittleman, 1940

The genus is remarkably free of synonymous forms, only four of these having been proposed:

Uta gratiosa Coues, Surv. W. 100th Merid., 1879, **5**, 596. Synonym of *Urosaurus ornatus graciosus.*

Uta (Phymatolepis) lateralis Boulenger, Ann. Mag. Nat. Hist., 1883, **5**, (11), 342. Synonym for *Urosaurus ornatus schottii,* see Mittleman (1941:136, *et seq.*).

Uta gularis Cragin, Bull. Washburn Lab. Nat. Hist., 1884, **1**, 7. Synonym of *Urosaurus ornatus schottii*, see Mittleman (*supra cit.*).

Uta parviscutata Cope, Rept. U. S. Nat. Mus. 1898 (1900): 324. Synonym for *Urosaurus microscutatus.*

Within the genus, three major subdivisions, or complexes, are readily discernible:

ornatus
symmetricus
linearis
graciosus
levis
wrighti
caeruleus
schmidti
chiricahuae
clarionensis
schottii

ornatus Complex

nigricaudus
microscutatus
gadovi
irregularis

nigricaudus Complex

bicarinatus
tuberculatus
unicus
nelsoni
anonymorphus
auriculatus

bicarinatus Complex

Distribution of the genus. Southern Texas west through New Mexico and Arizona to the desert portion of California bordering the Colorado River, north to Utah (and Wyoming ?) and southwestern Colorado; The Baja California peninsula; south through Mexico from the Rio Grande to the Mexican Plateau, and south along the western slopes of the Sierra Madre del Occidental, terminating at Tonolá, Chiapas; also the islands of Socorro, Clarion, María Madre, María Magdalena, Tiburón, Magdalena, Espíritu Santo, San Francisco, San Marcos, Coronado, Carmen, Danzante, Ballena, and San José, in the Pacific Ocean and Gulf of California.

Key to the Lizards of the Genus Urosaurus

1. Enlarged antero-dorsal femoral scales smooth (Socorro Island, Revillagigedo Archipelago). *auriculatus*

   Enlarged antero-dorsal femoral scales strongly keeled 2

2. Enlarged dorsals in a single broad band, uninterrupted by an intervening series of smaller scales 3

   Enlarged dorsals separated into two or more parallel series by the presence of a vertebral series of smaller scales 7

3. Tail two or more times the length of head and body combined (the Colorado River valley from extreme southern Nevada to the Gulf of California; probably extreme northwestern Sonora; northeastern Baja California as far south as San Felipe). *graciosus*

   Tail less than twice the length of head and body combined 4

4. Dermal folds, when present, not heavily crested with tubercles; blue abdominal patches only in males; enlarged dorsals comparatively small 5

   Dermal folds present, always crested with tubercles of fairly large size; abdominal blue patches sometimes in females as well as males 6

5. Enlarged dorsals larger, from 17 to 24 in the length of head from tip of snout to posterior edge of interparietal; gular region in males deep yellow or orange (Cape region of Baja California; Magdalena, Espíritu Santo, and Ballena islands). *nigricaudus*

Enlarged dorsals smaller, 32 to 36 in the length of head from tip of snout to posterior edge of interparietal; gular region in males usually blue (Baja California north of the Cape region, north to Borego Valley, California; the islands of San Marcos, Coronado, Carmen, Danzante, San José, San Francisco and Magdalena).
microscutatus

6. Four to seven rows of enlarged dorsal scales; abdomen of both sexes with a blue wash and/or blue patches; dorsolateral folds not converging in the sacral region (Jalisco and Michoacán).
gadovi

About three rows of enlarged dorsal scales; only males with a blue abdomen; dorsolateral folds converging in the sacral region to form prominent ridges ("Mexican Plateau").
irregularis

7. Enlarged dorsal scales in two or more prominent, nearly equal series on either side of the smaller vertebral series; frontal transversely divided; postfemoral dermal pocket almost invariably present; ventrals rounded posteriorly and never carinate 12

Enlarged dorsal scales in a single principal series on either side of the intervening vertebrals; frontal almost always entire; postfemoral dermal pocket often absent, occasionally rudimentary; ventrals often mucronate to spinose, often carinate in the lateroventral areas 8

8. Enlarged dorsals commencing caudad of a line joining the anterior points of insertion of the fore-limbs; dorsals weakly keeled, rounded posteriorly, prominently pavemented; general habitus not at all rugose (Batopilas, Chihuahua).
unicus

Enlarged dorsals commencing craniad of a line joining the anterior points of insertion of the fore-limbs, or else equal with such a line; dorsals prominently keeled, usually mucronate or spinose, imbricate; ventrals imbricate; general appearance rugose. . . . 9

9. Form rugose; enlarged dorsals strongly carinate and prominently mucronate; tubercles of lateral and dorsolateral folds well developed; ventrals mucronate; gular surface generally stippled, with a light median area; blue abdominal patches of males quite extensive (Michoacán, Morelos, Puebla, Guerrero as far as Acapulco). *bicarinatus*

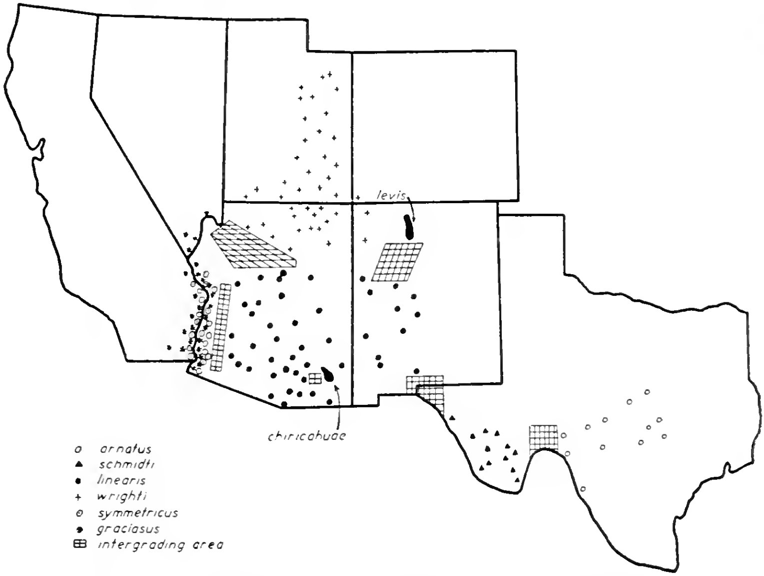

Fig. 8. Distribution of *Urosaurus* in the United States.

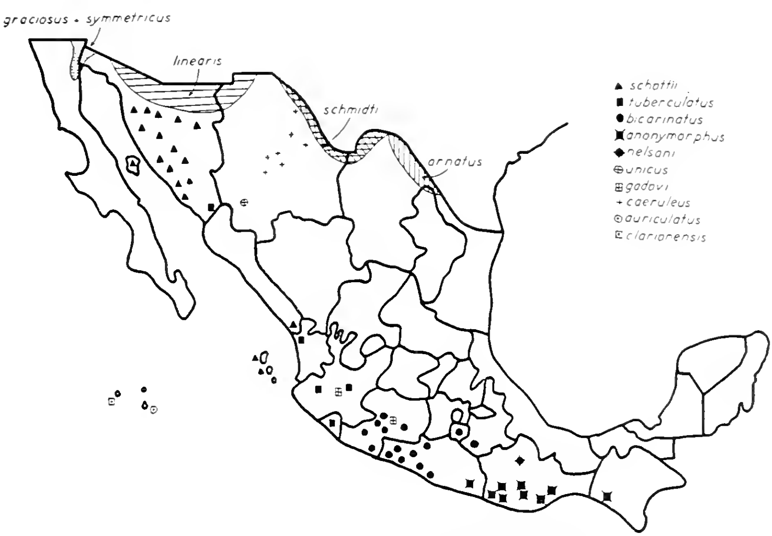

Fig. 9. Distribution of *Urosaurus* in Mexico.

General appearance somewhat less rugose; enlarged dorsals not so often mucronate; tubercles smaller, sometimes absent; ventrals less mucronate, occasionally rounded; gular surfaces evenly stippled; abdominal blue of males sometimes restricted to small sternal patches 10

10. Ventrals rounded; dorsolateral and lateral tubercles very poorly developed; enlarged dorsals commencing on the nape (Cuicatlán, Oaxaca).

nelsoni

Ventrals sub-mucronate to mucronate; dorsolateral and lateral tubercles well developed; enlarged dorsals commencing on the shoulders just craniad of a line joining the anterior points of insertion of the fore-limbs 11

11. Ventrals mucronate, prominently carinated laterally; gular scales with a tendency toward pavementation, especially anteriorly; gular surfaces evenly stippled; abdominal blue of males restricted to small sternal patches (Guerrero east of Tierra Colorada; Oaxaca, except the north-central portion; western Chiapas).

anonymorphus

Ventrals sub-mucronate (occasionally rounded), only faintly keeled on the lateral portions of the belly, or else not at all; gular scales imbricate; gular region with an even blue wash, and only barely flecked if at all; abdominal blue of males evenly distributed (Colima; Jalisco; southern Sinaloa; extreme southwestern Sonora).

tuberculatus

12. Enlarged dorsals commencing on the nape 13

Enlarged dorsals commencing on the shoulders, or caudad of them 14

13. Enlarged dorsals strongly keeled, scales of primary and secondary series almost equal in size; postfemoral dermal pocket absent or rudimentary; no prominent lateral pattern of dark whorls (Clarion Island, Revillagigedo Archipelago).

clarionensis

Enlarged dorsals not so rugose, scales of primary series prominently larger than those of the secondary series; postfemoral dermal pocket regularly present; a distinct lateral pattern of dark whorls (Tres Marias Islands; Tiburon Island; Sinaloa ?; Sonora, south of the line Caborca-Magdalena).

schottii

14. Tail two or more times the length of head and body combined (The Colorado River valley from extreme southern Nevada to the Gulf of California; probably extreme north-western Sonora; northeastern Baja California as far south as San Felipe).

graciosus

Tail less than twice the length of head and body combined . . . 15

15. Enlarged dorsals extending onto the basal portion of the tail for a distance equal to the length of the femur, or more; entire gular region, including the sublabials, a uniform bright blue (the northeastern quarter of Chihuahua).

caeruleus

Enlarged dorsals extending onto the basal portion of the tail for a distance equal to less than the length of the femur; entire gular region including the sublabials never completely blue 16

16. Three or four series (rarely two) of enlarged dorsals on either side of the vertebrals; enlarged dorsals not strongly keeled, not prominently imbricate; dorsolateral and lateral tubercles not affecting a diagonal arrangement; dorsolateral and lateral folds variable, but usually absent or poorly developed; general appearance not at all rugose 17

Two principal series of enlarged dorsals on either side of the vertebrals; enlarged dorsals strongly keeled and prominently imbricate; dorsolateral and lateral tubercles usually well developed and affecting a diagonal arrangement; dorsolateral and lateral dermal folds present; general appearance rugose 18

17. Enlarged dorsals quite flat, very weakly keeled, slightly imbricate, or just as often pavemented; dermal folds absent or rudimentary; dorsal basal tail scales barely or not at all differentiated from the lateral basal scales (Rio Arriba and Sandoval Counties, New Mexico).

levis

Enlarged dorsals more convex, more strongly keeled, more imbricate; dermal folds often present, with a fair degree of development; dorsal scales on the basal portion of tail abruptly differentiated from the much smaller, lateral basal scales (extreme southwestern Colorado; northwestern New Mexico; eastern and southern Utah; possibly extreme southern portions of Nevada and Wyoming; Arizona, to the south and east of the Colorado River in the northern portions of the state).

wrighti

18. Enlarged dorsals often irregularly arranged; lateral tubercles not affecting diagonal arrangements; average size less than 45 mm. snout to vent 19

Enlarged dorsals regularly arranged in parallel series on either side of the vertebrals; tubercles in parallel diagonal series; average size greater than 45 mm. from snout to vent...............20

19. Scales of primary series not twice as large as those of the secondary series; largest of the dorsals inferior in size to the enlarged femorals and tibials; ventral interhumeral and interfemoral areas immaculate, or but lightly stippled (Texas, west of the Pecos River in Brewster, Jeff Davis, and Presidio Counties; adjacent Chihuahua).

schmidti

Scales of primary series almost twice as large as those of the secondary series; largest of the dorsals equal to, or larger than, the enlarged femoral and tibial scales; ventral interhumeral and interfemoral areas heavily maculated (Texas, east of the Pecos River; probably adjacent Coahuila and Nuevo Leon).

ornatus

20. Largest of the dorsals equal to, or larger than the enlarged femorals; vertebrals extending onto the basal portion of the tail for a distance equal to half, or slightly more, of the length of the femur; the entire gular region in males, except the sublabials, an intense blue; head length/head width ratio averaging 81% (Chiricahua and Dos Cabezos Mountains, Cochise County, Arizona).

chiricahuae

Largest of the dorsals inferior in size to the enlarged femorals; vertebrals extending only onto the rump, or but slightly further; no uniform intense blue color present in male gular region; head length/head width ratio averaging 75% or less.............21

21. Enlarged dorsals separated into two parallel series by the width of the vertebral series, which is greater in width than the broadest of the enlarged dorsals; prefrontals and frontonasals usually three each; general coloration pallid, light tan above, whitish below, males with bright blue abdominal patches; average head length/head width ratio 75.4%; average length, snout to vent, 55.1 mm. (Colorado River valley and deserts of southwestern Arizona and southeastern California; northeastern Baja California, and northwestern Sonora).

symmetricus

Enlarged dorsals separated by a vertebral series whose width is less than that of the largest of the dorsal scales; prefrontals two, rarely three (by the inclusion of an azygous); frontonasals five; general color variable, but usually dark brown or gray with dark cross-bands, and heavily stippled, spotted, or blotched ventrally; abdominal patches in males dark blue to indigo; average head length/head width ratio 70.6%; average length, snout to vent, 46.4 mm. (Arizona, south of Lat. 35°30′, except in the Colorado River valley and desert; west to south-central New Mexico, and south to Sonora and Chihuahua as far as Lat. 31°).

linearis

UROSAURUS ORNATUS ORNATUS Baird and Girard

1852 *Uta ornata* Baird and Girard, Proc. Acad. Nat. Sci. Phila., **6**, 126 (part); Cope, Rept. U. S. Nat. Mus. 1898 (1900): 315 (part).

1921 *Uta ornata ornata* Schmidt, Amer. Mus. Nov., **22**, 6 (part); Van Denburgh, Occ. Pap. Calif. Acad. Sci., **10** (1), 207, 1922 (part); Stejneger and Barbour, Check List N. Amer. Amph. Rept., 1923: 52 (part); *ibid*, 1933:57 (part); *ibid*, 1939:62 (part); Mittleman, Herpetologica, 1940, **2**, (2), 33; Mittleman, Jour. Wash. Acad. Sci., 1941, **31**, 77.

Type locality. Rio San Pedro (=Devil's River), Val Verde County, Texas.

Cotypes. USNM 2750 (male and female).

Diagnosis. One or two rows of enlarged, keeled, imbricate, irregularly arranged vertebral scales, extending from a point slightly caudad of the insertions of the fore-limbs posteriorly to the basal portion of the tail on which they continue for a distance equal to less than half the length of the femur; vertebrals bordered on either side by two series of larger scales which are keeled and prominently imbricate; enlarged dorsals not regularly dispersed; scales of primary series approximately twice as large as those of the secondary series; largest of the dorsals superior in size to the enlarged femorals and tibials; other dorsal scales very small, granular, and largely pavemented, or only but slightly imbricate, except for a series on the dorsolateral line which extends from a point anterior to the axilla posteriorly to the groin; anteriorly, this series is continuous and forms a dorsolateral ridge, but posteriorly it is broken up into small clusters of slightly enlarged, tubercular scales around a central, much larger, mucronate scale; diagonally arranged clusters of tubercles absent from lateral areas; on the lateral

line a few sparse clusters of barely enlarged tubercles; a fairly distinct lateral fold; two prominent series of cervical tubercles which extend posteriorly from the ear and join the dorsolateral series of enlarged scales immediately anterior to the axilla, although rarely they do not so merge, and instead retain their individual identity; ventral to the cervical tubercles and dorsolateral tubercles is usually a third, and often a fourth series of tubercles, which are almost ventral in position; posterior surfaces of thighs and arms covered with small granules similar to those on the sides and dorsum of body, while the antero-dorsal portions of the thighs, and a band around the tibiae are covered with large, mucronate, keeled, imbricate scales; ventrals smooth, rounded to submucronate, about equal in size to the scales forming the posterior edge of the gular fold; thirteen of the largest dorsal scales equal to the length of the head from snout to posterior border of occipital; frontal transversely divided; femoral pores 10–11; enlarged postanal plates in males conspicuous; a postfemoral dermal pocket regularly present. Coloration (alcoholic): dorsal surfaces of body and tail grayish to brown, with cross-bars of light brown which are edged with pale blue; head tan with a few pale blotches of blue or gray; limbs dorsally blue-gray with cross-bars of brown; venter of limbs and body whitish, venter of digits tan; tail mottled with light brown anteriorly, and uniformly shaded with the same posteriorly; chin and gular region mottled with blue and brown, labials a dark grayish blue which suffuses onto the lateral portions of the head; venter of limbs and tail, as well as interhumeral and interfemoral areas, heavily stippled with brown or gray; bright blue abdominal patches in males. Description from USNM 83117, male; 7 miles south of Babyhead, Llano County, Texas. Measurements of fifty adults, both sexes; head length, 11.15 mm; head width, 8.08 mm; snout to vent, 42.25 mm; hind leg, 27.60 mm.

Distribution. TEXAS: Llano, Burnet, Sutton, Kerr, Edwards, Hays, Comal, Bexar, Uvalde, Guadalupe, and Val Verde (east of the Pecos River) Counties. MEXICO: Probably Coahuila and Nuevo Leon.

Remarks. This subspecies is unaccountably absent from most collections of Mexican Urosauri. I have examined several specimens in the United States National Museum which bear only the noncommittal data "Border" or "Mexico"; these are undoubtedly referable to this race, but since they lack additional information, are useless in further delineating the range of *ornatus*. Baird (1859:7) mentions a specimen, USNM 2764, from Eagle Pass, Texas, which in itself would prove the certainty of the occurrence of *ornatus* in Coahuila

at least. The specimen from Sonora, USNM 2737, also mentioned by Baird (*loc. cit.*) is probably referable to *linearis* if the provenance is accurate; I have not examined it. A single specimen in the United States National Museum, USNM 78541, while an excellent example of this form, is not included here, since it purportedly was taken in Victoria County, Texas, which is considerably out of the known range of other available material. Until further collecting substantiates this record, I consider it best to temporarily delete it.

The type locality is here restricted to the Rio San Pedro, Texas, and the reference to Sonora omitted, on the grounds that Baird and Girard had a single specimen from this latter Mexican state, and at the time confused it with their "*Uta ornata*". The Sonoran form is *linearis*, which was later recognized and so named. The cotypes were both taken at the Rio San Pedro, and are so catalogued. Since they agree with other *ornatus* from the same general region, and since the Sonoran specimen available at the time of original description was not of the same race, the type locality is therefore restricted.

Urosaurus ornatus schmidti Mittleman

1940 *Uta ornata schmidti* Mittleman, Herpetologica 2, **2**, 33, pl. 3, fig. 1

Type locality. Fort Davis, Jeff Davis County, Texas.

Type. USNM 32929, male.

Diagnosis. From original description: "Closely related to *Uta ornata ornata*, but differing from that race as follows: Enlarged dorsal scales arranged more regularly; the inner series of enlarged dorsal scales not twice as large as those of the outer series; largest of the dorsal scales occasionally equal to, but more often smaller than, the enlarged, keeled scales of the antero-dorsal surfaces of the tibia and femur; enlarged dorsal scales commencing well caudad of a line joining the anterior points of insertion of the fore-limbs. Lateral fold usually incomplete when present. Dorsolateral series of tubercles and enlarged scales usually quite prominent. Elongated series of tubercles on neck somewhat more prominent. Coloration of both sexes similar, in most respects, to that of *ornata*, save that the heavy ventral mottling of the interhumeral and interfemoral areas found in *ornata* is regularly lacking in *schmidti*, or at best is represented by a light flecking of blue-gray. Measurements of holotype: Snout to posterior border of ear, 11.5 mm; head width, 9 mm; snout to vent, 44 mm; hind-limb (insertion to tip of 4th toe, exclusive of nail), 31 mm; tail, 70 mm." The measurements of twenty-five adults of both sexes

are as follows: head length, 10.65 mm; head width, 8.16 mm; snout to vent, 43.20 mm; hind leg, 28.70 mm.

Distribution. TEXAS: Brewster, Jeff Davis, and Presidio Counties. MEXICO: North of Lat. 29° in Chihuahua and possibly Coahuila.

Remarks. Mexican records for *schmidti*, like in the case of *ornatus*, are based principally on specimens in the United States National Museum, bearing only the data "Border" or "Mexico". Apparently the only true record for this subspecies from Mexico, is that of Smith (1935:178), who reports "*Uta ornate ornata*" from near Samalayuca, Chihuahua. Since this is definitely out of the range of *ornatus*, and further, since the specimen bears no resemblance to Smith's *caeruleus*, and finally, since it is entirely within the normal range of *schmidti*, it is accepted as a *bona fide* record. As I have mentioned previously (1940:34), Gadow's record (1905:194) for *Uta elegans* from Juarez, Chihuahua, which Smith interprets as probably being referable to *ornatus* (=*schmidti*), is more probably *Uta stansburiana stejnegeri*.

Two of the original paratypes (USNM 32932-3) from El Paso County, Texas have been reexamined, and deleted from the range of this form, since they have been found to be intergrades with *linearis*, as some newly available material from southern New Mexico further indicates. However, *schmidti* may still be taken in the southern portion of this county. Probably it will also be disclosed in Hudspeth and southern Culberson Counties.

UROSAURUS ORNATUS CAERULEUS Smith

1935 *Uta caerulea* Smith, Univ. Kan. Sci. Bull., **12**, (7), 172, pl. 26; Mittleman, Jour. Wash. Acad. Sci., 1941, **31**, 76.

Type locality. Thirty miles north of Chihuahua City, Chihuahua, Mexico.

Type. David H. Dunkle—Hobart M. Smith Coll. No. 132, now deposited in the Kansas University Museum.

Diagnosis. Two vertebral rows of enlarged, irregularly arranged, weakly carinated scales, extending from a point slightly craniad of a line joining the anterior points of insertion of the fore-limbs, posteriorly onto the base of the tail for a distance equal to the length of the femur; vertebrals bordered on either side by two series of enlarged, imbricate, weakly carinated scales, the primary series slightly larger than the secondary; largest of the dorsals inferior in size to the largest of the tibials; dorsolateral tubercles but slightly enlarged, and dispersed in irregular little clusters; ventrals rounded, smooth, imbricate;

frontal transversely divided; a post-femoral dermal pocket. Coloration of male (from original diagnosis, *loc. cit.*): "Entire ventral surfaces of body and tail, except chest, base of tail, and an area between the hind legs, sky blue; dorsum with about seven transverse black bars on each side; bars usually blue-edged." Measurements of type (Smith, *loc. cit.*): "Snout to anterior border of ear, 10.0 mm; head width 10.0 mm; snout to vent, 49.5 mm; hind leg, 30.0 mm."

Distribution. Northeastern Chihuahua, south of Lat. 29°.

Remarks. I have recently pointed out (1941:76) the close relationship between *schmidti* and *caeruleus*, and mentioned the existence of intergrades between these two forms. At the time, I hesitated to formally designate *caeruleus* as a subspecies of the *ornatus* complex, because the extant material which indicated this intergradation bore no more explicit data than "Mexico", for the most part. I had hoped in the interim to acquire or locate specimens which would more precisely indicate the distribution of both these subspecies in Chihuahua. Unfortunately, such specimens have not yet become available. However, since some specimens at least have been seen which do indicate this relationship, and some definite action must be taken, *caeruleus* is here accorded the trinomial.

The subspecies *schmidti* and *caeruleus* are quite easily separated. Thus, in *caeruleus*, the enlarged dorsals extend onto the basal portion of the tail for a distance equal to the length of the femur, or slightly more, whereas in *schmidti* the distance traversed is rarely equal to half the length of the femur; largest of the dorsals inferior to the femorals in *caeruleus*, larger than the femorals in *schmidti*; *caeruleus* with the gular blue wash including the sublabials, while *schmidti* possesses the sublabials white or gray, but always distinct from the remainder of the gular region.

UROSAURUS ORNATUS LINEARIS Baird

1859 *Uta ornata* var. *linearis* Baird, U. S. Mex. Bound. Surv., **2**, 7; Cope, Rept. U. S. Nat. Mus. 1898 (1900):315.

1921 *Uta ornata linearis* Schmidt, Amer. Mus. Nov., **22**, 6; Mittleman, Jour. Wash. Acad. Sci., 1941, **31**, 68; Mittleman, Proc. Biol. Soc. Wash., 1941, **54**, 165.

1875 *Uta symmetrica* Yarrow, Surv. W. 100th Mer., **5**, 569; Boulenger, Cat. Liz. Brit. Mus., 1885, **2**, 213 (part); Cope, Rept. U. S. Nat. Mus. 1898 (1900):317 (part); Van Denburgh, Occ. Pap. Calif. Acad. Sci., 1922, **10** (1), 202 (part).

Type locality. Los Nogales, Sonora, Mexico.

Type. USNM 2759, lost or destroyed.

Neotype. USNM 62077, female, Los Nogales, Sonora, Mexico. F. J. Dyer, Collector.

Diagnosis. Superficially similar to *U. o. ornatus* and *U. o. schmidti*, but principally differing as follows: enlarged dorsals usually commencing just craniad of a line joining the anterior points of insertion of the fore-limbs; enlarged dorsals in two very regular series on either side of the vertebrals; scales of the secondary series approximating those of the primary series in size; enlarged dorsals larger, more strongly carinated; cervical, dorsolateral, and lateral tubercles more strongly developed; lateral tubercles usually affecting a diagonal arrangement from axilla to groin; dorsolateral and lateral dermal folds prominent; blue abdominal patches of males more often fused medially; general appearance much more rugose and bristling; average snout to vent size larger, maximum size attained greater (56 mm. snout to vent, in largest recorded *linearis*; 51.5 mm. largest *schmidti*; 46 mm. largest *ornatus*).

Distribution. ARIZONA: Widespread throughout the state south of Lat. 35°30′, and east of Long. 114°, except in Yuma County, where it occurs only as far west as Long. 113°30′. NEW MEXICO: Generally south of Lat. 35°, except for the southeastern quarter of the state bounded by Lat. 34° and Long. 106°. MEXICO: Sonora and Chihuahua, in the area bounded on the west by long. 113°30′, on the south by Lat. 31° (the line Reforma—Cananea—Sabinal—Lucero), and on the east by Long. 106°30′.

Remarks. The present subspecies has unduly suffered at the hands of various workers. Undoubtedly this is in a large measure due to the original description (*loc. cit.*), which merely said "Similar in markings to the described character of *U. ornata*, but with four linear interrupted black stripes instead of transverse bands." The error being in many cases, the presumption that the linear striping was supposedly the only specific character to be considered. The linear striping can be shown in nearly every subspecies of *ornatus* in the United States, and is a mere aberrant pattern variant. It is unfortunate that Baird rested the distinction of his species on such a character. None the less, Schmidt (1921) pointed out the distinctness of the central Arizonan and northern Sonoran form, and correctly applied the name *linearis* to this subspecies, thus distinguishing it from the Texas and Californian races (*ornatus* and *symmetricus*). His attempt to revive *linearis* from the synonymy was short-lived, unfortunately, for Van Denburgh (1922:207) did not see fit to recog-

nize this distinction, and instead used "*symmetrica*" to designate the several races inhabiting the Colorado River valley, most of Arizona, northern Sonora and New Mexico; authors since Van Denburgh have uniformly accepted his nomenclature, the exception being Stejneger and Barbour (1923, 1933, 1939) who have properly restricted *symmetricus* to the Colorado River valley and desert, but accord *ornatus* a range extending from Texas to California.

The type of *linearis* was lost or destroyed some time prior to 1890; in the interests of future workers I have designated a neotype.

For a summary of certain mensural data of *linearis* see the discussions of the following two subspecies.

Throughout its range, despite a wide distribution and some degree of superficial variation, *linearis* remains remarkably constant in its chief diagnostic characters as given above. Occasionally local populations differ to a certain degree from the majority of available specimens, but in nearly every case, these aberrations can be shown to be of an incipient nature, and within the limits of variation of the subspecies. In one case, however, distinctive morphological trends are correlated with geographic isolation, such that the population is worthy of formal designation. This population has recently (Mittleman, 1941:165) been named, and is discussed below.

UROSAURUS ORNATUS CHIRICAHUAE Mittleman

1941 *Uta ornata chiricahuae* Mittleman, Proc. Biol. Soc. Wash., **54**, 165.

Type locality. Pinery Cañon, Chiricahua Mountains, 6000 ft., Cochise County, Arizona.

Type. MVZ 7751, male.

Diagnosis. "Resembling *Uta ornata linearis* superficially, but differing in the greater size of the enlarged dorsal scales; the extension of the vertebral series of enlarged scales onto the basal portion of the tail for a greater distance; greater proportionate width of the head; and a different arrangement of colors and pattern."

"*Description of type.* Two, occasionally three, rows of enlarged, keeled, imbricate, irregularly arranged vertebral scales, extending from a point a trifle craniad of the insertions of the fore-limbs posteriorly onto the basal portion of the tail for a distance equal to half the length of the femur; vertebral scales bordered on either side by two series of regularly arranged, imbricate, and prominently keeled

scales which are larger than the vertebrals, equal in size to the enlarged femoral scales, and larger than the enlarged tibial scales; scales of the inner series of enlarged dorsals not much larger in size than those of the outer series, or else scales of both series approximately equal in size; other dorsal scales very small, granular, or flattened, lightly keeled and barely imbricate; on the dorsolateral line a series of enlarged scales which extends from a point just anterior to the axilla, posteriorly to a point just caudad of the groin; dorsolateral enlarged scales tubercular, and disposed around other larger, spinose, strongly carinated scales to form small clusters; distinct dorsolateral and lateral folds present; lateral areas with prominent series of enlarged tubercles diagonally dispersed; two short, prominent cervical series of tubercles, and below these, a lateral series of the same, and a ventrolateral series; lateral cervical tubercles merging with the series of tubercles of the dorsolateral line; posterior surfaces of thighs and arms covered with small granules, while the superior and anterior surfaces are covered with large, keeled, mucronate, imbricate scales; ventrals smooth, submucronate, about equal in size to the scales posteriorly bordering the gular fold; eleven of the largest dorsal scales equal to the length of head from snout to posterior border of occipitals; frontal transversely divided; femoral pores 12-12; postanal plates conspicuously enlarged; a postfemoral dermal pocket present. Coloration (alcoholic): Head light brown dorsally, with fine spots and streaks of a darker brown; dorsum of body, limbs, and tail varying from dark brown to a blue-gray, faintly splotched with light blue; the five irregular cross bands which extend transversely from the lateral fold to the enlarged dorsals and break on the median line of the back, dark brown edged with light blue; venter of limbs with a suffused blue-gray; chin, from anterior gular fold up to but not including the sublabials, a bright sky blue; two large, brilliant, light blue abdominal patches which are fused medially, and sprinkled with dark gray laterally; interhumeral and interfemoral areas uniformly shaded with dark gray, and a few flecks of blackish; preanal region with a light blue wash. Measurements of type: Snout to posterior edge of ear, 12 mm; head width 11.5 mm; snout to anus, 51 mm; hind leg (insertion to tip of 4th toe, exclusive of nail), 33.5 mm; tail (tip partially regenerated), 70 mm. Measurements of entire type series (thirty-seven adults, both sexes): Snout to posterior edge of ear, 11.32 mm; head width 9.16 mm; snout to anus, 47.70 mm; hind leg (insertion to tip of 4th toe, exclusive of nail), 30.80 mm. (these figures represent the weighted arithmetic means)."

"*Distribution.* Restricted to the type locality and the Dos Cabezos Mountains, Cochise County, Arizona."

"*Remarks.* The present form is accorded a subspecific designation on the basis of certain specimens from nearby localities in Cochise County, which exhibit characteristics that must be considered intermediate between *chiricahuae* and *linearis.* In the main, however, such specimens are few, and *chiricahuae* is essentially different from the *linearis* population of Cochise County, as well as from other points in the distribution of this latter, parental form.

"The new subspecies exhibits certain mensural differences which are best illustrated by various ratios. Thus, the type series shows an average head length—head width ratio of 81 percent, the range being from 75 percent to 96 percent, with three specimens having a ratio of 75 percent, twenty-six specimens with ratios varying from 79 percent to 83.5 percent, and eight specimens with ratios between 84 percent and 96 percent. By comparison, a test sample of thirty-seven adult *linearis* of both sexes selected at random from a large series of specimens taken at Ramsey Canyon, Huachuca Mountains, Cochise County, Arizona, shows an average head length—head width ratio of 70.8 percent, the range being from 58.25 percent to 83 percent; only four specimens have ratios greater than 77.5 percent, while the great majority are in the quartile sector of the mean. Certain other ratios differ in *linearis* and *chiricahuae*, but none so markedly as this one. Test samples of *linearis* from Pima and Yavapai Counties, Arizona, as well as some from certain counties in New Mexico, agree well with the Ramsey Canyon sample in their morphological as well as mensural details, and exhibit about the same differences towards *chiricahuae.*

"The uniform blue color of the gular region in *chiricahuae* is very rare in *linearis*, and is usually replaced by a medial blotch of yellow or orange; similarly, the relative uniformity of color in the interhumeral and interfemoral regions in *chiricahuae* is, in the great majority of *linearis*, replaced by a heavy stippling or mottling of dark gray or brown.

"The subspecies *linearis* and *chiricahuae* are further differentiated by the nature of the enlarged dorsal scales; in the former race, these are usually smaller than the enlarged femoral and tibial scales, and only rarely equal them in size. In *chiricahuae*, the enlarged dorsals at least equal the femorals in size, and are consistently larger than the tibials. Further, the vertebral series of enlarged scales in *linearis* does not extend onto the basal portion of the tail for a distance equal

to much more than one quarter the length of the femur; in *chiricahuae*, the distance is equal to at least half the length of the femur, often more."

UROSAURUS ORNATUS SYMMETRICUS Baird

1858 *Uta symmetrica* Baird, Proc. Acad. Nat. Sci. Phila., December, p. 253; Boulenger, Catl. Liz. Brit. Mus., 1885, **2**, 213; Cope, Rept. U. S. Nat. Mus. 1898 (1900):317 (part); Stejneger and Barbour, Check List N. Amer. Amph. Rept., 1917:52.

1921 *Uta ornata symmetrica* Schmidt, Amer. Mus. Nov., **22**, 6; Van Denburgh, Occ. Pap. Calif. Acad. Sci., 1922, **10** (1), 202 (part); Stejneger and Barbour, Check List N. Amer. Amph. Rept., 1923:52; *ibid*, 1933:57; *ibid*, 1939:62.

Type locality. Fort Yuma, Imperial County, California.

Type. USNM 2760, lost or destroyed.

Neotype. USNM 2744a([1]), male; Fort Yuma, Imperial County, California; M. Thomas, collector.

Diagnosis. Closely related to *Urosaurus ornatus linearis*, but differing from that subspecies as follows: vertebral series of enlarged scales wider than the breadth of the widest enlarged dorsal scale; usually three prefrontals and three frontonasals, although occasionally there is present an additional anterior pair of much reduced frontonasals whose presence is due to the fission of the frontonasals proper; average size larger, maximum size attained greater; coloration very pallid above and below.

Distribution. The Colorado River desert and valley in Yuma and Mohave Counties, Arizona; and Imperial, Riverside, and San Bernadino Counties, California; the Colorado River valley and desert to the delta, in Baja California and the Gran Desierto of Sonora.

Remarks. The type locality for *symmetricus* has been generally accepted (Stejneger and Barbour, 1939:62) as Fort Yuma, Arizona. Although it makes no practical difference which side of the river the type was actually collected on, there being no difference in the populations of either side, I am of the opinion that the proper point of origin of the type was Fort Yuma, Imperial County, California. The type locality, as originally stated (Baird, *loc. cit.*), was "Ft. Yuma, Cal."; Dr. Stejneger advises me in a letter that the change to the

[1] USNM 2744, sixteen specimens with the same data; neotype has been designated by "a" scratched on the tag.

Arizona locality was influenced by the fact that Baird subsequently (1859:7) referred this form to the "Gila River", which is in Arizona. It seems to me that this in no way changes the provenance of the type, for in addition to the original citation of the type locality, it may be that Baird meant the valley of the Gila River where it becomes an affluent of the Colorado, which could be construed to logically include old Fort Yuma, California. Further, in several other instances, much of Baird's data in the United States and Mexican Boundary Survey Report is erroneous; in some cases due to typographical error, in others apparently due to errata in information or data. Certainly, since there is little difference either way, and the point is purely technical, it seems best to adhere to the type locality as originally given.

A thorough investigation to find the type specimen, in 1890, by Dr. Stejneger, failed to disclose it. Since it has yet to be found, and was in all probability lost or destroyed, I have herewith designated a neotype.

The most northerly point from which I have seen *symmetricus*, is Needles, San Bernadino County, California. Mr. Klauber advises me in a letter that the specimens of "*Uta ornata symmetrica*" which he has recently recorded from Willow Beach, Mohave County, Arizona (1939:89), are actually referable to *U. o. graciosus*. I have examined some of the specimens of "*symmetrica*" reported by Cowles and Bogert (1936:37) from Black and Eldorado Cañons, Clark County, Nevada, and from Black Cañon and Travertine Springs, Mohave County, Arizona; I have similarly examined the "*Uta ornata*" reported by Yarrow (1883:56) from "Nevada"; I find that all of these specimens are intergrades of *U. o. linearis* x *U. o. wrighti*. Intergrades of *symmetricus* x *linearis* are apparently common from the Castle Dome, Chocolate, Dome Rock, and Plomosa Mountains, all in Yuma County, Arizona. This race is like many others of its genus, chiefly a boulder and cliff dweller. Although it will occasionally resort to small trees in the absence of its favorite medium, the ideal niche is on rocks, boulders, and cliffs.

The usual arrangement of prefrontals and frontonasals demands three of each; however, as noted above, occasional splitting will produce an additional, minute pair of frontonasals. Similarly, fusion is often encountered. The present race is most easily distinguished from *linearis* by the character of the enlarged dorsals which are widely separated on either side of the vertebrals, the distance separating the parallel rows of enlarged dorsals being greater than the width of the

widest enlarged scale; in *linearis* the distance between the opposite enlarged dorsal series is much less, due to the extreme crowding and imbrication of the vertebrals. Typically, *symmetricus* is a pale sandy color, with bright, but lightly tinted blue abdominal patches in the males. However, as previously noted, melanism is frequent, and many specimens, especially from the mountains, are a uniform blue-black dorsally and ventrally. This latter condition obtains in every known form of *Urosaurus*.

That *symmetricus* is a substantially and significantly larger form than *linearis* is brought out by the average snout to vent measurement of a series of 350 specimens of both sexes of the former race, which is 55.10 mm; the same measurement in a similar series of *linearis* averages 46.45 mm. A greater size is also attained by *symmetricus*, the maximum recorded in over 450 specimens being 63 mm. snout to vent, while the maximum size recorded for more than 1800 *linearis* is 56 mm. A somewhat wider head is also characteristic of *symmetricus*, the average head length head width ratio of the series of 350 specimens noted above, being 75.4%; the same ratio in a random sample of 350 adult *linearis* of both sexes is 69.23%.

UROSAURUS ORNATUS GRACIOSUS Hallowell

1854 *Uro-saurus graciosus* Hallowell, Proc. Acad. Nat. Sci. Phila., **7**, 92.

1859 *Uta graciosa* Baird, U. S. Mex. Bound. Surv., **2**, 7; Cope, Rept. U. S. Nat. Mus. 1898 (1900):325; Stejneger and Barbour, Check List N. Amer. Amph. Rept., 1917:50; *ibid*, 1923:50; *ibid*, 1933:56; *ibid*, 1939:61; Van Denburgh, Occ. Pap. Calif. Acad. Sci., 1922, **10** (1), 212.

1875 *Uta gratiosa* Coues, Surv. W. 100th Mer., **5**, 596.

Type locality. Lower California (=Southern California).

Cotypes. ANSP 8550–1, both males.

Diagnosis. A *Urosaurus* of the *ornatus* complex, closely resembling *symmetricus* in scalation, size, and color, but distinguished by the tail length which is two or more times the length of the head and body combined, and by the absence of vertebral scales separating the enlarged dorsals into two parallel series.

Distribution. The Colorado River desert and valley in NEVADA: Clark County; ARIZONA: Mohave and Yuma Counties; CALIFORNIA: San Bernadino, Riverside, Imperial and San Diego (*fide* Van Denburgh, 1922:214) Counties; MEXICO: Baja California along the Gulf of

California as far as San Felipe; probably the portions of Sonora adjacent to the Colorado River.

Remarks. The close alliance, yet differentiation existing between *graciosus* and *symmetricus* is a remarkable attestation to the sharp ecological preferences and consistencies characteristic of *Urosaurus* as a whole. The two subspecies are undeniably very close, and I can only consider them as equivalent offshoots of the same stock, of about equal age. Yet despite this superficial and possibly genetic nearness' *graciosus* and *symmetricus* remain distinct throughout the greater portion of their mutual range. Insofar as I can determine, although doubtless there are other contributing factors, the chief isolating mechanism seems to be simply a matter of ecological preference — *graciosus* being consistently a tree and shrub dweller, and *symmetricus* displaying an obvious preference for boulders and cliffs. In the southern portion of the range these ecological distinctions merge, and intergradation takes place, having been observed chiefly from the vicinity of Yuma, Arizona. Yet in itself this is further confirmation of the ecological postulation, for in the intergrading region there is not the abundance of distinctive ecological niches available for both forms which are found throughout the greater portion of the range. Yet even in the vicinity of Yuma, both *graciosus* and *symmetricus* to a large extent remain distinct, and intergrades are notably few.

When intergradation occurs between *graciosus* and *symmetricus*, the intergrades possess the distinctively long tails of the former race, but indicate their aberration by the nature of their enlarged dorsal scales, which tend to become smaller along the median line, and simulate the vertebral series characteristic of *symmetricus* and typically lacking in *graciosus*. Measurements and proportionate data for the two races are about the same, save for a somewhat narrower head in *symmetricus* and longer tail in *graciosus*. In coloration and pattern, both forms are nearly identical.

Urosaurus ornatus wrighti Schmidt

1921 *Uta wrighti* Schmidt, Amer. Mus. Nov., **22**, 3.

1922 *Uta levis* Van Denburgh, Occ. Pap. Calif. Acad. Sci., **10** (1), 208; Stejneger and Barbour, Check List N. Amer. Amph. Rept., 1923:51; *ibid*, 1933:56; *ibid*, 1939:61.

Type locality. Grand Gulch, 4000–5000 ft., San Juan County, Utah.
Type. AMNH 18097, male.

Diagnosis. Enlarged dorsal scales commencing well caudad of a line joining the anterior points of insertion of the fore-limbs; usually two vertebral series, the scales of which are very small, weakly keeled, and bordered on either side by a primary and two or three secondary series of enlarged dorsals, which are weakly to moderately keeled, and slightly imbricate; enlarged dorsals very gradually merging with the remainder of the dorsal scales; cervical tubercles moderately developed; dorsolateral and lateral tubercles and dermal folds absent or rudimentary; lateral scales at base of tail abruptly smaller than dorsal basal scales. Coloration (alcoholic) of male: Dorsum of head, body, and limbs and tail usually gray-blue, occasionally light tan or blue-black; limbs, body and tail barred with narrow cross-bands of dark blue or grayish; supralabials and infralabials suffused with white, which diffuses through part of the sublabials and gular region; median gular region with a yellow, orange, or whitish light spot; abdominal blue patches fused medially for the greater part of their length; interhumeral and interfemoral regions pale gray, mottled or not, but usually with dark gray or blue; venter of limbs and tail lighter than dorsal surfaces. Measurements of 200 adults, both sexes: Head length, 12.05 mm; head width 8.62 mm; snout to vent, 48.30 mm; hind leg, 30.70 mm.

Distribution. COLORADO: Montezuma County; NEW MEXICO: San Juan and McKinley Counties; UTAH: Uintah, Duchesne, Carbon, Emery, Grand, San Juan, Wayne, Garfield, Kane and Washington Counties; ARIZONA: Apache, Navajo, Coconino, and probably Mohave Counties, north of Lat. 35° 30′.

Remarks. Intergradation with *U. o. linearis* is common throughout the northern portion of Mohave County, Arizona, as well as in the vicinity of San Francisco Mountain, Coconino County, Arizona. Other cases of intergradation of *linearis* x *wrighti* have been previously discussed. Specimens from the vicinity of St. George, Washington County, Utah, are aberrant, and indicate the trend towards *linearis.* This subspecies may also be expected to occur in extreme southwestern Wyoming, as I have seen specimens from Vernal, Uintah County, Utah, which is but forty miles south of the Utah-Wyoming line. How far west it ranges is open to speculation; it seems quite possible that it will be found in northern Clark and southern Lincoln Counties, Nevada, at least.

The present subspecies has suffered unmerited oblivion at the hands of most authors, who have uniformly followed Van Denburgh (1922: 209) in regarding this form as being synonymous with the older *levis,* from which it is quite definitely distinguishable.

This form is consistently a dweller of large boulders and open cliffs. In the Navajo Country of Arizona and Utah, it was only in these associations that *wrighti* could be found, showing an extreme predilection for the vertical habitat. Indeed, we found this lizard extremely common along the sheer and overhanging cliffs which jut to meet the water, along the upper reaches of the Colorado River, from the point of affluence with the San Juan River in Utah, to Lee's Ferry, Arizona. In the Navajo Country it is one of the commonest of all reptiles, and is the first to appear in the morning, and one of the last to retire at dusk Knowlton (1934:11; 1938:236) has shown that this subspecies is an important insect pest control agent in Utah. Eaton (1935:10) has reported that courtship and copulation took place between a pair observed on June 14th, at an elevation of 6000–6300 ft., in northern Navajo County, Arizona.

Urosaurus ornatus levis Stejneger

1890 *Uta levis* Stejneger, N. Amer. Fauna, **3**, 108; Cope, Rept. U. S. Nat. Mus. 1898 (1900):313; Stejneger and Barbour, Check List. N. Amer. Amph. Rept., 1917:50; *ibid*, 1923:51 (part); *ibid*, 1933:56 (part); *ibid*, 1939:61 (part); Van Denburgh, Occ. Pap. Calif. Acad. Sci., 1922, **10** (1), 208 (part); Schmidt, Amer. Mus. Nov., 1921:6.

Type locality. Tierra Amarilla, Rio Arriba County, New Mexico.

Type. USNM 11474, male.

Diagnosis. Most closely related to *Urosaurus ornatus wrighti*, but distinguished as follows: enlarged vertebrals and the three or four series of enlarged dorsals bordering them on either side, extremely flat, very weakly keeled, barely imbricate, or often pavemented; cervical, dorsolateral, and lateral tubercles absent or very poorly developed; lateral fold occasionally present, but then very weakly differentiated; dorsal scales of basal portion of tail very gradually merging to the lateral basal scales, without any noticeable demarcation between dorsal and lateral scales. Coloration (alcoholic) of male: olivaceous tan above, slightly darker beneath; dorsum with six to eight greenish brown wavy cross-bands, which break on the vertebral line; abdominal patches bright blue, usually not fused medially. Measurements of ten adults (six males, four females): head length, 10.7 mm; head width 7.3 mm; snout to vent, 42.8 mm; hind leg, 28.6 mm.

Distribution. New Mexico: Rio Arriba and extreme northern Sandoval Counties.

Remarks. The present subspecies is accorded the trinomial on the basis of specimens from extreme southern Sandoval and Torrance Counties, New Mexico, which are intermediate between this form and *linearis*. Doubtless too, collecting in southwestern Colorado will reveal further intergradation between *levis* and *wrighti*.

Urosaurus o. levis has had a peculiar history which I believe is principally attributable to the rarity of this form in collections. Prior to Schmidt's naming of *wrighti* and Van Denburgh's synonymizing of this race with *levis*, *levis* was properly considered the rare lizard it is. When, however, the form which ranges so widely and commonly over much of Colorado, Utah, and Arizona (*wrighti*) was believed conspecific with *levis*, this latter name crept into the literature quite rapidly. Thus, Van Denburgh (1922), Knowlton (1934, 1938), Woodbury (1931), Smith (1935) and others, have variously discussed and figured supposed *levis*; the fact remains that very few of these references more than touch in part on any phase of the natural history or taxonomy of *levis*, nearly all the references bearing actually on *wrighti*.

Despite diligent inquiry and investigation, I have been able to discover only eleven specimens of *levis* in various collections. Ten of these specimens are adults, and one is a juvenile. All of these specimens have been taken in the comparatively rigidly proscribed area composed of Rio Arriba and northern Sandoval Counties, New Mexico. These specimens serve to show that while the alliance between *levis* and *wrighti* is unquestionably close, the distinguishing characters given are actually present and constant. Further, *levis* which is an end form of *wrighti* (again through ecological isolation), is apparently closely restricted to its own distinctive region, and is not a common animal. Whether the rarity of this subspecies in collections indicates also its rarity in nature, or simply a lack of collecting in the region it inhabits, I cannot say; none the less, the distinctions between *levis* and *wrighti* are real and correlated with geographic distribution.

While I hesitate to offer mensural data based on ten specimens of lizards as highly variable as the Urosauri, it may be said that *levis* is seemingly a smaller animal, with a proportionately narrower head, and proportionately longer hind leg than *wrighti*.

The type of *levis*, as indicated previously, is actually a male. Cope (1900:314) has correctly figured the type specimen, but in his table on the same page has reversed the data; thus, USNM 11474, the type, actually is a male, and USNM 8554, a paratype, is a female.

UROSAURUS CLARIONENSIS Townsend

1890 *Uta clarionensis* Townsend, Proc. U. S. Nat. Mus., **13**: 143.

Type locality. Clarion Island, Revillagigedo Archipelago, Mexico.

Type. USNM 15904, male.

Diagnosis. Enlarged dorsals strongly carinate, prominently imbricate, and very regularly dispersed in two parallel series on either side of a series of very small vertebrals which commence on the nape; scales of primary series well developed, and slightly larger than those of the secondary series; largest of the dorsals considerably larger than the enlarged femorals and or tibials; dorsolateral tubercles very well developed, as are those of the lateral fold; between the dorsolateral tubercles and the lateral fold are short series of tubercles which occasionally present a diagonal arrangement; frontal transversely divided; lateral abdominal scales mucronate and carinate. Coloration (alcoholic) of male: general over-all color blue above and below; limbs and tail lightly ringed with gray or black; dorsum with longitudinal dark streaks. Measurements of six adults (three of each sex): head length, 13.78; head width, 10.55 mm; snout to vent, 54.50 mm; hind leg 41 mm.

Distribution. Restricted to the type locality.

Remarks. This species is most closely allied to *schottii*, of existing forms, and shows no close affinity for the neighboring *auriculatus* of Socorro Island. Because of this, it assumes quite some importance in the phylogenetic aspects of the Urosauri, and will be dealt with more thoroughly in connection with this problem.

It can be confused with no other known *Urosaurus*, by reason of its distinctive morphology and greatly restricted habitat. It should be added that although the postfemoral dermal pocket is absent in most specimens, a few examples possess a very small whorl of reduced scales which may be interpreted as a rudimental pocket.

I have not been able to learn anything of the natural history of this species.

UROSAURUS ORNATUS SCHOTTII Baird

1858 *Uta schottii* Baird, Proc. Acad. Nat. Sci. Phila., **10**: 253.
1883 *Uta (Phymatolepis) lateralis* Boulenger, Ann. Mag. Nat. Hist., **5**, (11): 342.
1884 *Uta gularis* Cragin, Bull. Washburn Lab. Nat. Hist., **1**: 7.
1885 *Uta lateralis* Boulenger, Cat. Liz. Brit. Mus., **2**: 214; Schmidt, Amer. Mus. Nov., 1921:6.
1922 *Uta ornata lateralis* Van Denburgh, Occ. Pap. Calif. Acad. Sci., **10** (1): 199; Mittleman, Jour. Wash. Acad. Sci., 1941, **31**: 66.
1941 *Uta ornata schottii* Mittleman, Copeia, **3**: 138.

Type locality. Magdalena, Sonora, Mexico.

Type. USNM 2761, destroyed sometime prior to 1889. (See Mittleman, 1941:138).

Diagnosis. One to three vertebral rows of enlarged, imbricate, carinate, irregularly arranged scales, extending from the nape posteriorly onto the base of the tail for a distance equal to about half the length of the femur, and bordered on either side by two series of enlarged dorsals, of which the primary series is considerably the larger; largest of the dorsals greater in size than the enlarged femorals and tibials; two or three elongated series of thoracic tubercles; a dorsolateral series of enlarged, mucronate tubercles, extending from the supra-axillary or thoracic region to the basal portion of the tail; several lateral series of enlarged, spinose granules; ventrals abruptly differentiated from the granular laterals; abdominal and gular scales prominently imbricate and submucronate; frontal typically divided transversely; postfemoral dermal pocket regularly present. Coloration (alcoholic) of male: six to nine dark spots on the dorsolateral line from axilla to groin; a vertebral series of smaller, alternating spots extending from the nape to the basal portion of the tail; dorsolateral and lateral spots on both sides usually joined by undulated brown bands, which are occasionally broken medially; dorsal coloration of body and limbs generally light brown or gray, or occasionally a uniformly rufescent dark brown which completely obliterates any semblance of pattern; limbs barred above with dark brown; dorsum of tail similar to dorsum of body, and lightly ringed with pale brown; lateral areas a light blue-gray, and lightly streaked with irregular brown patches; abdomen with two elongate, light blue patches, which may or may not be fused medially; rostral and supralabials white, this color extending posteriorly in a narrow streak to the insertion of the fore-limbs; infralabials flecked with gray; gular region anterior to the fold, light blue; underside of limbs, tail, and interhumeral and interfemoral areas, whitish. Measurements of fifty adults, both sexes, insular and mainland: head length, 12.6 mm; head width, 9.6 mm; snout to vent, 49.5 mm; hind leg 35.9 mm.

Distribution. Tres Marias Islands; Tiburón Island; Sinaloa (Boulenger, 1883:342); Sonora, south of the line Caborca-Magdalena.

Remarks. I have recently shown (1941:138) that the long-standing *Uta lateralis* Boulenger, 1883, is synonymous with the older *Uta schottii* Baird, a name for many years considered of puzzling identity. Since *lateralis* was demonstrated to intergrade extensively with *linearis* (Van Denburgh, 1922:199; Mittleman, 1941:68), subspecific designa-

tion was made; similarly, therefore, *schottii* assumes the trinomial of the name it has replaced.

The extent of the southerly distribution of *schottii* remains entirely uncertain. Similarly, the status of Urosauri from Sinaloa generally, is an unknown quantity. There is an utter dearth of material from this Mexican state, and until the gap is filled, we are confronted with several inexplicable problems. For instance, Boulenger (*loc. cit.*) has recorded *schottii* (under *lateralis*) from Presidio de Mazatlán, Sinaloa, which is several hundred miles south of other known records for this subspecies, except for those from the Tres Marias Islands. On the other hand, *U. b. tuberculatus* has been taken at the Presidio, which previously constituted a new northerly record for the subspecies, until I reported it from extreme southern Sonora, which again moved the distribution of *tuberculatus* several hundred miles northward. Such a distribution is paralleled by *Sceloporus nelsoni* (Smith, 1939:364), but is not duplicated by any of the Urosauri. It is entirely possible that further collecting in Sinaloa will explain these queer problems of distribution, and possibly show that *schottii* and *tuberculatus* are simultaneously distributed throughout this state and extreme southern Sonora, but are effectively separated by ecological and/or physiological barriers.

Comparisons made between large series of insular and mainland *schottii* reveal only slight mensural differences, which are neither constant nor marked enough to warrant any distinctions being made between the two populations.

U. o. schottii and *U. o. linearis* are easily separated. Thus, *schottii* possesses the enlarged dorsals on the nape, whereas in *linearis* they commence about equal with a line joining the anterior points of insertion of the fore limbs; *schottii* possesses the scales of the primary series about twice as large as those of the secondary series, while *linearis* has the scales of both series about equal in size. In *linearis* there is no prominent pattern of dorsolateral spots in series, while in *schottii* such a pattern is distinctive and always present, save in melanistic individuals.

Summary of the *ornatus* Complex

The *ornatus* complex is that group within the genus *Urosaurus* characterized by two or more principal series of enlarged dorsals on either side of the vertebral series, or else with a uniform band of enlarged scales which is not longitudinally separated by a vertebral series; in addition to these premises, members of the *ornatus* complex regularly

possess a postfemoral dermal pocket, with the exception of one form in which it is occasionally present in a rudimentary condition; further, the frontal plate is always transversely divided.

A critical study of *Urosaurus* indicates that *schottii* is at present most nearly akin to the primitive form which largely gave rise to the modern genus. To further corroborate this view, available data conform to several of Adams' criteria (1902), and indicate the general region composed of western Sonora, the adjacent portion of Baja California, and northern Sinaloa as the likely center of origin and dispersal of *Urosaurus*. It is notable therefore, that *schottii* largely populates this region, almost to the complete exclusion of other known forms.

The form *schottii* seems to have developed two very distinctive genetic lines; one characterized by the *ornatus* complex, the other by the *bicarinatus* complex. Further, this genetic divergence must have taken place at a relatively early date, for on the neighboring Clarion and Socorro islands of the Revillagigedo Archipelago, we find the very dissimilar *clarionensis* and *auriculatus* respectively, the former belonging to the *ornatus* complex, and the latter to the *bicarinatus* complex. Through the agency of the specific distinctness of these two forms, and available knowledge concerning the geological history of west-coast Mexico, the period of development of the two diverse genetic lines in *Urosaurus* can be placed as having occurred sometime between the late Oligocene and the early Miocene, for in this era the solid mass of land which composed modern west-coast Mexico and extended as far west as the Revillagigedo Archipelago became immersed, and formed the modern Californian peninsula as well as the numerous Gulf and Pacific islands.

Probably during the early Miocene *schottii*, or more properly perhaps, the pre-*schottii* form, commenced to successively spread and investigate the land masses to the north and south of the center of origin. To the north, the proliferation of the line *linearis-wrighti-levis* formed, while on the east-west axis, *schmidti-ornatus-caeruleus* developed to the east, and *symmetricus-graciosus* to the west; *chiricahuae* is an end form of *linearis*, and only owes its morphological distinctness to a forced inbreeding necessitated by ecological limitations and restrictions. The species *clarionensis* developed early in the history of the group, and bears a closer resemblance to *schottii* than does any existing *Urosaurus* known. The *ornatus* complex will therefore be seen to follow a pattern of multiplication of species through isolation and mutation of older, pre-existing species (Dunn, 1934), and to present an orthogenetic line of dynamic status.

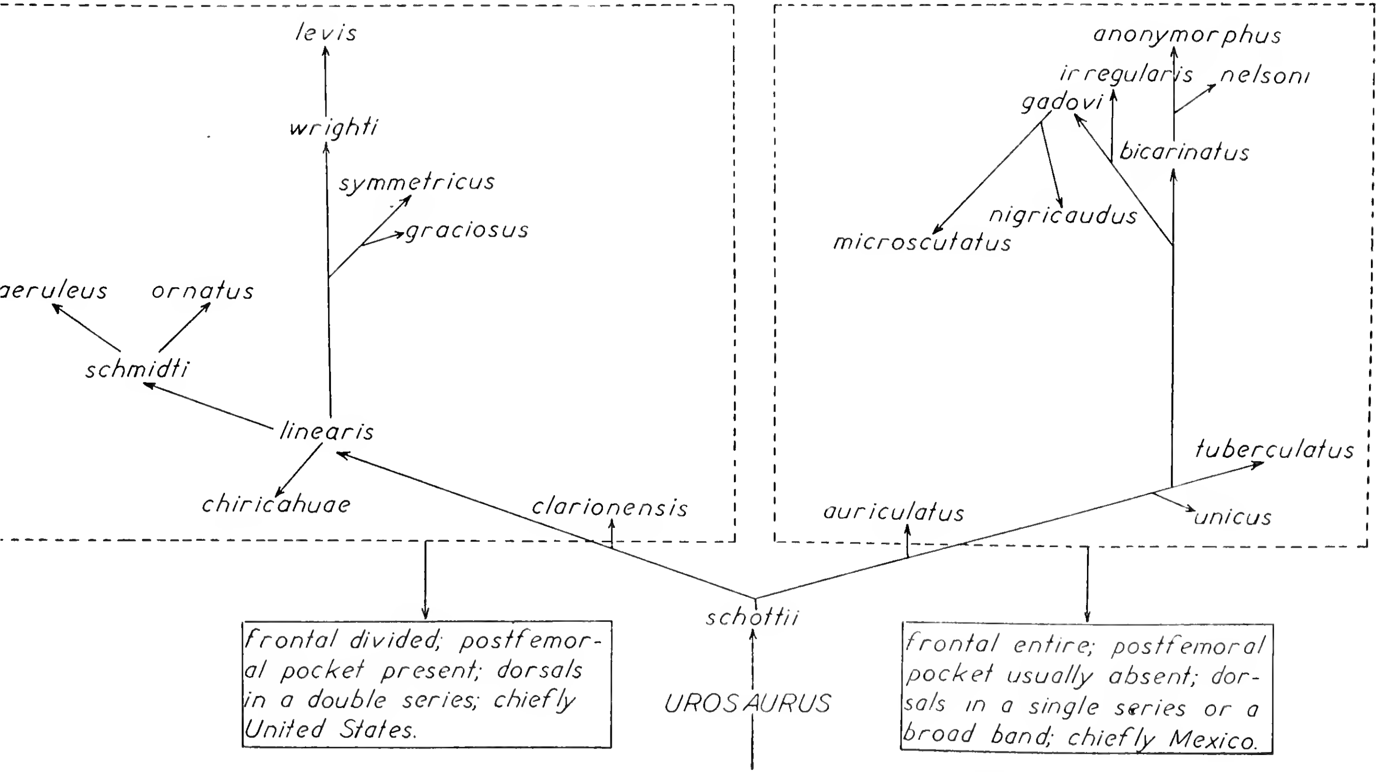

Fig. 10. Probable phylogeny and interspecific relationships in *Urosaurus*.

The trend in the *ornatus* complex has been, from south to north, and from the central portion to peripheral sectors, towards a decrease in the size of the enlarged dorsals, an increase in the size of the vertebrals to ultimately produce a band of dorsal scales of uniform size (notably attained in *graciosus*), a loss of heavy melanins dorsally, and a greater degree of gular pigmentation. Further, peripheral forms tend to develop proportionately wider heads, longer legs, and a lesser degree of carination on the dorsal scales.

UROSAURUS GADOVI Schmidt

1921 *Uta gadovi* Schmidt, Amer. Mus. Nov., **22**: 3.

Type locality. Cofradia, Jalisco, Mexico.

Type. AMNH 20355, male.

Diagnosis. Frontal usually entire, rarely split transversely into a large anterior portion and a much smaller posterior section; four to seven rows of enlarged dorsal scales along the median line, of which the median row is largest, and the remainder progressively diminish in size; no vertebrals separating the enlarged dorsals into parallel longitudinal series; enlarged dorsals extending posteriorly from the shoulders to the basal portion of the tail, or often ending in the sacral region; enlarged dorsals smaller than the enlarged femorals, and equal to or smaller than the tibials; external to the enlarged dorsals are several poorly defined, slightly enlarged clusters of tubercles, extending from axilla to groin; on the dorsolateral line of the neck and body a dermal fold crested with numerous small series of enlarged tubercles interspersed with larger, flat, mucronate scales; usually another, short fold, restricted to the supra-axillary region; along the lateral areas are three to five longitudinal series of clustered tubercles; lowest series of tubercles often in contact with the ventrals; ventrals abruptly differentiated from the lateral granules; gular scales flat, and largely pavemented; scales of the gular fold elongate, mucronate, imbricate, and laterally, faintly keeled; ventrals imbricate, mucronate to spinose, and faintly keeled especially laterally, males with rather small postanals; postfemoral dermal pocket absent. Coloration (alcoholic): Dorsal color ranging from slatey gray (in melanistic specimens) to a lighter brownish gray, or brown; head, tail, and median line of back slightly lighter; three to six blackish cross-bands, about evenly distributed from cervical region to sacrum, these being about as wide as three to five of the largest dorsals; in all except the darkest specimens, the dorsolateral, lateral, and ventrolateral surfaces are maculated with whitish areas,

these usually being restricted to small clusters of enlarged, tubercular scales which dot these areas; entire labial and gular region, save for a rounded area immediately anterior to the gular fold, spotted and irregularly streaked with black, these being heavier in the males; venter of limbs, basal portion of tail, and interhumeral and interfemoral areas whitish and lightly maculated with dark flecks; abdomen, from axilla to groin, covered with an overlay of blue in both sexes, but anteriorly more prominent and assuming an ovoid outline in males; tail faintly circled with narrow brown bands. Because there is a greater quantitative dimorphism between the sexes of this species, than in any other form yet observed, the mensural data have been correlated as given below, based on forty specimens (twenty-two males, eighteen females) of adults:

Measurement or ratio	*males*	*females*	*mean of all specimens*
Head length	10.5—**11.7**—13.0	9.0—**10.4**—12.5	11.17
Head width	8.0— **9.4**—10.0	7.0— **8.3**—10.0	8.92
Head length/head width	75.0—**80.5**—87.0	75.0—**79.4**—87.0	79.25
Snout to vent	40.0—**46.5**—52.0	34.0—**40.2**—51.0	43.35
Hind leg	23.0—**28.1**—30.5	21.0—**24.6**—29.0	26.22
Tail length	68.0—**73.5**—80.0	51.0—**61.4**—77.0	67.46

The left and right figures represent the lowest and highest measurements and/or ratios obtained; bold figures are the means.

Distribution. Jalisco and Michoacán, Mexico.

Remarks. Urosaurus gadovi has been almost unknown since the time of its original description; save for the type and five other specimens (two in very poor condition), no other material has been extant until very recently. In 1939, Dr. Hobart M. Smith had the good fortune to collect thirty-seven specimens of this species, of which thirty-five were sexually mature adults, at Apatzingan, Michoacán. These have benefited the present study enormously, and have made it possible to present a more complete picture of the variation of this form.

This species possesses smaller postanals (in males) than any other form in the genus, these scales being so small in immature specimens that determination of sex must be made by dissection. It is further unique in that it is the only species in the genus wherein both males and females possess the blue abdominal coloration normally restricted to the males alone.

Urosaurus gadovi cannot be confused with any species of the genus occurring on mainland Mexico. It is geographically remote from any

related species of the genus; so much so, in fact, that several pertinent facts in the phylogeny of *Urosaurus* remain a matter of conjecture and uncertainty. In the main, however, *gadovi* appears most closely allied to *U. nigricaudus* of Baja California, and is probably a mainland remnant of the primitive *Urosaurus* stock which gave rise principally to certain peninsular species.

Urosaurus irregularis Fischer

1882 *Phymatolepis (Uta) irregularis* Fischer, Abh. Nat. Ver. Bremen, **7**: 232, pl. 17, figs. 1–4.

1885 *Uta irregularis* Boulenger, Cat. Liz. Brit. Mus., **2**: 216; Schmidt, Amer. Mus. Nov., 1921, 22:6; Smith, Zoöl. Ser. Field Mus. Nat. Hist., **24**, (4): 23.

Type locality. ". . . aus dem Hochlande von Mexico. . . ."

Type. Municipal Natural History Collection of Bremen no. 437.

Diagnosis. (from original description): dorsum covered with carinated scales; along the dorsal median line larger keeled scales not arranged in regular rows; two longitudinal ridges converging posteriorly on the back anterior to the pelvic region; the dorsal median series of irregular, larger scales diffusing more and more towards the base of the tail on both sides; after the fifth verticil of the tail these scales become smaller, more mucronate, and less noticeable, and, commencing at this point they arrange themselves with those of the ventral surface into complete verticils which surround the tail up to the tip. Ground color greenish-gray, ventrally lighter; on the back, three narrow, black, oblique stripes, the laterad-most of which diverge outward posteriorly; gular region speckled and marbled with yellowish gray and black; ventral side light gray.

Distribution. "The plateau of Mexico."

Remarks. The above description is condensed from the original one of Fischer's, and only those passages which are of any practical use are given. I have utilized a literal translation of Fischer's phraseology; for his kind help in the translation of the original paper, I am indebted to Dr. Eugen H. Mueller, of Ohio University.

The status of *irregularis* is indeed a puzzling one, and I have given the problem much thought, attacked it from every angle, and have gotten a uniform result: that no opinion whatsoever can be offered concerning this animal. Fischer's description is a lengthy mass of verbiage, replete with minute data, but lacking such information as the sex of his

type, measurements, etc. It seems certain, however, if the description and plate are at all accurate, that the type was a female, for Fischer's notes conspicuously lack any reference to distinctive abdominal coloring, in an otherwise complete color description. Further, the ventral figure in the plate does not show enlarged postanals.

Other than the original description and plate no other information on this species is available. I have not seen the type (if it is indeed still in existence), nor have the few museum catalogues which bear entries of "*irregularis*" borne fruit. Smith (1939:23) reported *irregularis* from Laguna Coyuca, near Acapulco, Guerrero (FMNH 25884), but this specimen was found to be an intergrade of *bicarinatus* x *anonymorphus*. Similarly, a specimen catalogued as *irregularis* in the Museum of Comparative Zoölogy collection, was actually an example of *U. gadovi*. I do not know from whence Schmidt's brief description (1921:6) of *irregularis* was drawn, but I suspect that the original description of Fischer was used. Although Boulenger's specimens (1885:216) have not been available, I believe that they are also referable to *bicarinatus* or one of its allies, with the original description furnishing the source material for Boulenger's descriptive notes.

Although the extensive Mexican explorations and collections of Nelson and Goldman, and more recently Taylor and Smith, have failed to bring to light any specimens that can be considered conspecific with *irregularis* as I know it from its original description, I prefer to retain this form in name at least, as valid. I take this action on the basis of Fischer's notes and plates, which if accurate to any degree, picture a very distinct animal and one not to be considered synonymous with any known form. Further, great regions which quite possibly are populated with Urosauri, as the Durangian and Zacatecan uplands, are very poorly known today, save that they possess a highly distinctive endemic fauna. It is quite possible that *irregularis* will be found to occupy a niche somewhere in this portion of "der Hochlande von Mexico."

Urosaurus nigricaudus Cope

1864 *Uta nigricauda* Cope, Proc. Acad. Nat. Sci. Phila., :176.

Type locality. Cape San Lucas, Baja California.

Cotypes. USNM 5307 (twelve specimens).

Diagnosis. Enlarged dorsals in seven to ten rows, commencing about equal to the insertions of the fore-limbs, and extending posteriorly to the sacrum; median rows of dorsals largest, and progressively diminish-

ing in size as they extend laterally; enlarged dorsals prominently keeled, imbricate, rounded posteriorly; seventeen to twenty-four of the largest dorsals equal to the length of head from tip of snout to posterior border of the interparietal; dorsolateral and lateral folds usually present, nearly always crested with enlarged, spinose scales; usually several lateral clusters of enlarged tubercles; frontal usually entire, sometimes transversely divided; enlarged femorals and tibials larger than any of the dorsals; ventrals mucronate on the gular fold, pectoral, and lateral areas, but rounded elsewhere. Coloration (alcoholic) of male topotype: dorsum of body, limbs, head and tail ranging from grayish to dark brown; limbs and tail ringed with narrow bands of dark brown to black; head finely lined with dark brown; body with nine alternating short bars which extend from the dorsolateral fold to about the median line of the back; dorsal bars about two or three scales wide, and of a dark brown color, edged with pale blue posteriorly; labial regions flecked with gray, as is also the gular region save for a light central area which is a pale tan; pectoral region flecked rather heavily with gray, as are also the undersides of the limbs and tail; abdomen with two elongate sky blue patches which are partially fused medially; pre-anal region with a blue wash; abdominal and lateral areas flecked with numerous individual scales which are a paler blue than the remainder of the body. Measurements of fifty specimens, both sexes: head length, 10.35 mm; head width, 7.75 mm; snout to vent, 42.0 mm; hind leg, 28.0 mm; tail, 66.0 mm.

Distribution. South of Lat. 24°30′ on Baja California peninsula; also the islands of Espiritu Santo, Ballena, San José and Magdalena (?).

Remarks. This species seems closely restricted to the southern end of the Californian peninsula, for with the exception of its possible occurrence on the Isla Magdalena (*fide* Van Denburgh, 1922:218), from whence I have not seen any specimens, all available records are closely clustered in the region extending from La Paz to Cape San Lucas. The range of *nigricaudus*, insofar as its insular distribution is concerned, is in the main exclusive of *microscutatus.* However, this latter species has been taken on San José Island by Linsdale (1932:362), and I have similarly reported (*supra*) the occurrence of *nigricaudus* on this island too, based on two specimens in the National Museum (USNM 24413–4). However, San José offers a multitude of ecological niches, as I judge from Nelson's description (1921:92), and it seems entirely possible that both forms can exist there without undue competition. At any rate, the *nigricaudus* from this island do not differ in any way from peninsular examples. I have not seen any *nigricaudus* from Mag-

dalena Island, although I have examined *microscutatus* from this locality. Here again it seems quite probable for both species to occur, in view of the two suitable localities which are to be found on the island, and again, both of these well separated (Nelson, 1921:89). Linsdale (1932:361) mentions the occurrence of *nigricaudus* in a variety of situations, notably all vertical, with no specimens having been found on the ground.

UROSAURUS MICROSCUTATUS Van Denburgh

1894 *Uta microscutata* Van Denburgh, Proc. Calif. Acad. Sci., **2** (4), 298.
1900 *Uta parviscutata* Cope, Rept. U. S. Nat. Mus. 1898:324, fig. 45.

Type locality. San Pedro Martir Mountains, Baja California.

Type. Stanford University Museum no. 1221, male.

Diagnosis. A fairly small *Urosaurus,* characterized by the diminutive size of the enlarged dorsal scales; enlarged dorsals extending from the shoulders to the sacrum, in about ten rows; dorsals keeled, rounded posteriorly, pavemented or semi-imbricate, about thirty-two to thirty-six in the length of the head from snout to posterior border of interparietal; dorsolateral and lateral dermal folds and tubercular clusters present; otherwise similar to *nigricaudus* in structure and dorsal coloration; ventral coloration usually a uniform deep blue over the entire gular and abdominal areas, except for the pectoral region, which is grayish, and maculated with darker gray or black; central portion of gular surfaces usually most intense blue; venters of limbs and tail blue-gray to brown; ventrolateral and lateral regions often with flecking of light blue which is usually restricted to a single scale; abdominal blue patches in males usually fused for their entire length. Measurements of fifty adults, both sexes: head length, 10.45 mm; head width, 8.05 mm; snout to vent, 39.75 mm; hind leg, 28.2 mm; tail 72.45 mm.

Distribution. Borego Palm Cañon, San Diego County, California, south through the San Pedro Martir district and Lower Sonoran zone of Baja California to Medano Amarillo at Lat. 24° (*fide* Linsdale, 1932:362); also the islands of San Marcos, Coronado, Carmen, Danzante, San José, San Francisco and Santa Magdalena.

Remarks. This and the preceding species are certainly closely allied, with *microscutatus* apparently a derivative of the older *nigricaudus.* There is little to separate them, in a qualitative sense, unless it be the ventral coloration. In other respects, they are chiefly distinguishable by the nature of certain quantitative features. Possibly the simplest

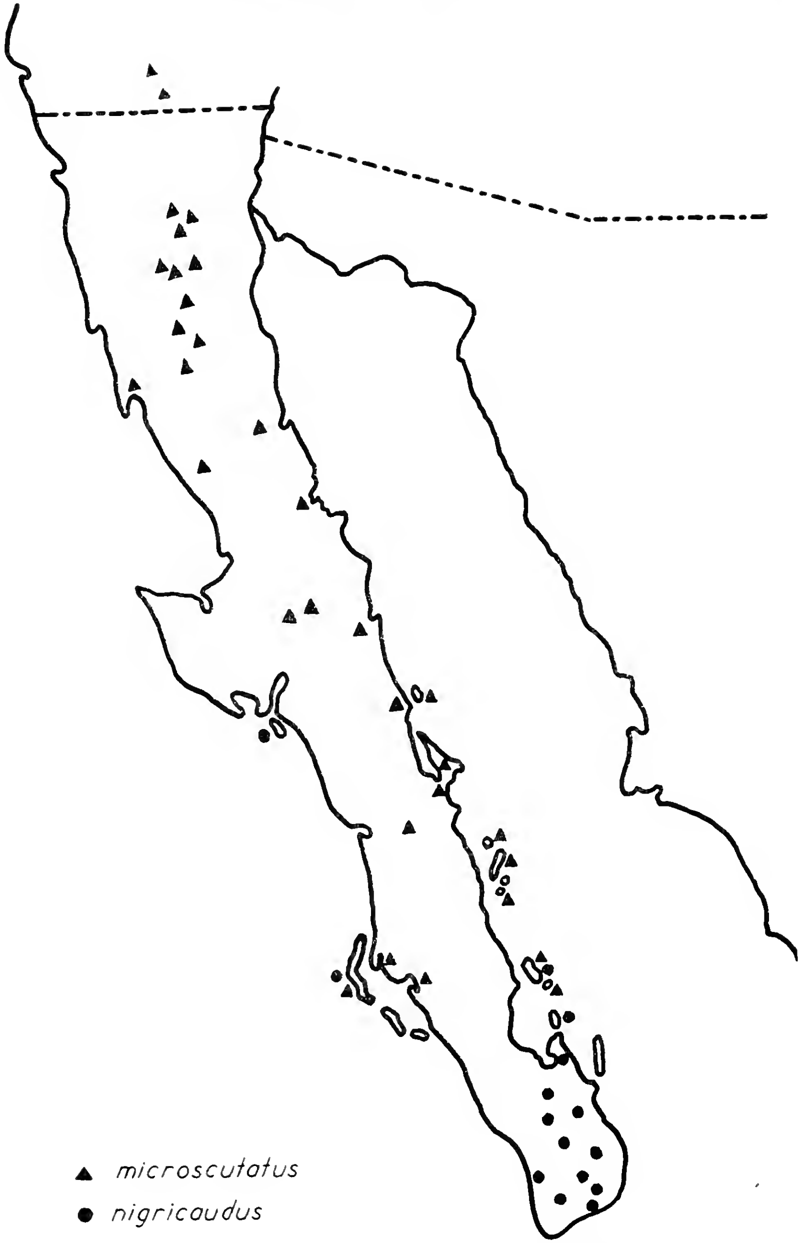

Fig. 11. Distribution of *Urosaurus microscutatus* and *Urosaquus nigricaudus* in Baja California and the United States.

feature to verify in *microscutatus* is the size and number of the enlarged dorsal series. However, these increase in size, and decrease correspondingly in number, as the species progresses in a southerly direction. I believe that intergradation between *microscutatus* and *nigricaudus* will be shown when a more complete series of specimens of both forms, from the region between Comondú and Baie Magdalena, is available. In three specimens of *microscutatus* from Comondú (USNM 65822–4), there is a definite tendency toward *nigricaudus;* thus, the dorsals are larger than in more northerly *microscutatus,* and the heavy blue wash so typical of this species is replaced by two abdominal patches and a gular pigmentation quite akin to that of *nigricaudus.* While these specimens seem to definitely indicate an incipient, if not actual intergradation, I hesitate to accord the species involved the trinomials on such slim evidence.

Despite their close alliance and the certain derivation of one from the other, *microscutatus* and *nigricaudus* are apparently everywhere distinct geographically and ecologically (unless in the Comondú-Baie Magdalena region previously discussed). Linsdale (*loc. cit.*) points out that while *microscutatus* is often found on the ground, *nigricaudus* is always restricted to the vertical habitat on trees, rocks, and fences. Even so, available specimens indicate that there is no overlap of ranges, unless it is in the hypothetical intergrading area. Where the two species occur together, as on San José and Magdalena islands, they are even then distinct ecologically. Both of these islands are only recently isolated from the mainland of the peninsula, and represent two or more leveled mountains, with intervening areas filled by the deposition of sand by the sea. As such, they present diverse ecological niches which are filled by the two species in question, each to the exclusion of the other.

Mensural data indicate that while *microscutatus* is a somewhat smaller form than *nigricaudus,* it possesses a proportionately longer and wider head, a longer hind leg and a longer tail. Klauber (1939:89) says that the blue gular color usually present in males of *microscutatus* in the southerly portions of the range, is replaced by orange, with a yellow central spot, in the northern regions. A few specimens from Jacumba, San Diego County, California (USNM 75338) have the same blue coloration of the gular region that is to be seen elsewhere in the range of *microscutatus.* The only region where the blue gular color is replaced by any other hue, as far as I know, is in the extreme southern end of the range, in the vicinity of Comondú, where the few available specimens display the orange (tan in preservative) throat and gular

region characteristic of *nigricaudus*. If indeed *microscutatus* does exhibit this color aberration in the northern part of its range, it would be interesting to determine if it undergoes intergradation with any other species in the genus. Specimens from the north are still too few to determine this.

Summary of the *nigricaudus* Complex

The *nigricaudus* complex presents a small, compact group of four more or less closely allied forms, of somewhat uncertain origins. They compose a homogeneous group by reason of the usually entire frontal, and uniform band of enlarged dorsals which are not divided into parallel series by the presence of vertebral, smaller scales; there is also a certain uniformity of color and pattern, and a relative uniformity of size.

While the uncertainty surrounding the status of *U. irregularis* has been previously discussed, it may be said that this form (judging solely from the original description and figures) seems to be the most primitive one of the complex, and apparently the only one allied to any species outside the complex. The derivation of *microscutatus* from *nigricaudus* has been indicated elsewhere; similarly, the very close relationship between *nigricaudus* and *gadovi* has been discussed. I presume that *nigricaudus* is directly derived from *gadovi* in view of the greater age of the Jalisco-Michoacán region which this latter species inhabits, and the known history of the formation of the Californian peninsula. Retrogressive reasoning, therefore, would show that the complex arose somewhere near or on the west coast of Mexico, possibly in the Jalisco-Michoacán region, and spread westward. Continuing in this vein, it follows that some sort of relationship, perhaps not so tenuous, exists between *gadovi* and the much-discussed *irregularis*. By the process of elimination, it has been shown that *irregularis* would hypothetically inhabit some portion of the Mexican highlands, or plateau, a region of comparatively great age. Since this region is older than any other known which supports any of the members of the complex; and further, since the derivative nature of *microscutatus* and *nigricaudus* is known, as is also the relatively recent character of their habitat, it would follow, I assume, that *irregularis* is the primitive member of the *nigricaudus* complex. I have pointed out that in the *ornatus* complex, there is a distinct trend toward an increase in size of the vertebrals, which ultimately has resulted in the uniform size of the enlarged dorsals in *graciosus*. It does not seem far-fetched at all

to suppose that a similar condition has produced the *nigricaudus* group. Occasional specimens of *U. b. bicarinatus* have the parallel rows of enlarged dorsals interrupted by an inordinate increase in size of a few of the vertebrals. A successive development such as this would result in a form which we might today identify as *U. irregularis.* From *irregularis* to the highly evolved *microscutatus* we can establish a fairly certain line.

The trend in the line *irregularis-gadori-nigricaudus-microscutatus* is from a large, strongly imbricate, heavily keeled, mucronate enlarged dorsal scale, to a much smaller one, which is only partly keeled, occasionally pavemented, and distinctly rounded posteriorly. Similarly, in the same line, the ventrals change from sharply mucronate, spinose, keeled scales, to rounded, smooth ones. There is also a gradual increase in the number of rows of enlarged dorsals; thus in *irregularis* the number is two or three, in *gadori* four to seven, in *nigricaudus* seven to ten, and in *microscutatus*, at least ten, and occasionally twelve to fourteen. The heavily crested dorsolateral folds which form actual ridges, progressively diminish, from *irregularis* to *microscutatus,* until in this latter form, the folds are only topped with small clusters of slightly enlarged tubercles. In addition to these premises, from *irregularis* to *microscutatus* there is a tendency to produce a smaller body and a longer tail.

UROSAURUS AURICULATUS Cope

1871 *Uta auriculata* Cope, Proc. Boston Soc. Nat. Hist., **14**: 303.

Type locality. Socorro Island, Revillagigedo Archipelago.

Type. USNM 7027, female.

Diagnosis. A fairly large member of the genus, unique in the possession of smooth enlarged femorals; two rows of vertebrals, which are rather weakly carinate, imbricate, and regularly arranged, bordered on either side by a single series of enlarged dorsals, which are relatively flat and weakly keeled, and not very regularly dispersed; frontal divided or entire; external to the primary series of enlarged dorsals there are often one or two additional series of irregularly arranged scales which do not continue in even rows, and are of variable size; along the dorsolateral fold a variable series of enlarged scales, some tubercular and others flat and mucronate, these in irregular groups; post-femoral dermal pocket variable; coloration ranging from grayish to bright blue, with six to eight short cross-bars along the dorsum in alternating position, which are light-edged (usually with pale blue) on

their posterior borders; light lateral and ventral fleckings of pale blue, restricted to single scales, or small groups of tubercular scales; males with extensive deep blue abdominal patches, females with an uneven light blue abdominal wash. Measurements of seven adults, both sexes: head length, 16.5 mm; head width, 12.45 mm; snout to vent, 65.5 mm; hind leg, 44.0 mm.

Distribution. Restricted to the type locality.

Remarks. As indicated under the discussion of *U. clarionensis* as well as the remarks dealing with the *ornatus* complex as a whole, *auriculatus* is well separated from the nearby *clarionensis* of Clarion Island, and rather than exhibiting any morphological similarity with this latter species, the alliance is with the *bicarinatus* group.

This species is one of the largest in the genus, and appears to have adapted itself to its insular habitat very well, if size and the number of specimens inhabiting the island (*fide* Cope, *loc. cit.*; Van Denburgh, 1922:199) may be considered sound criteria on which to base such a supposition. The smooth enlarged femorals are unique in the genus, and of uncertain phyletic importance and derivation. As a whole, the species is not a rugose one, and seems to have lost much of the bristling appearance common to other Urosauri; it is likely that a chance mutation, or series of mutations, has caused the appearance of these peculiar characters, and have become prominently evidenced by the enforced inbreeding of the island population.

UROSAURUS BICARINATUS BICARINATUS Duméril

1856 *Phymatolepis bi-carinatus* Duméril, Arch. Mus. Hist. Nat. Paris, **8**: 549, pl. 23, figs. 2, 2a, 2b.

1864 *Uta bicarinata* Cope, Proc. Acad. Nat. Sci. Phila., **16**: 177; Boulenger, Cat. Liz. Brit. Mus., 1885, 2:215; Schmidt, Amer. Mus. Nov., 1921, **22**: 6; Smith, Univ. Kan. Sci. Bull., 1935, **12** (7): 169.

1941 *Uta bi-carinata bi-carinata* Mittleman, Jour. Wash. Acad. Sci., **31**: 70.

Type locality. "Mexico".

Type. Not designated; if in existence, probably in the Muséum d'Histoire Naturelle de Paris.

Diagnosis. Two or three vertebral series of enlarged scales extending in a continuous or often broken line from the nape to the basal portion of the tail; on either side of the vertebrals is a single series of greatly enlarged, strongly carinate, imbricate scales, which are often irregularly dispersed, and frequently interrupted by the intrusion of small heterogeneous scales, or the aberrantly large size of a vertebral

scale; largest of the dorsals subequal to the enlarged femorals and tibials, which are strongly carinate; external to the enlarged dorsal series, a series of enlarged scales which almost equal the primary dorsals in size and rugosity; these latter scales sometimes in contact with the dorsals, but more often separated from them by the varying width of two to four of the small granular scales of the dorsum; these enlarged scales bordering the primary dorsals are also irregular in size and disposition, but usually occur in a line which commences anterior to the primary dorsals; two or three series of thoracic tubercles; a prominent series of enlarged tubercles, and mucronate and spinose flatter scales on the dorsolateral line; ventral to the dorsolateral series of enlarged scales, are four other series of enlarged tubercles, the lowest of which is in contact with the ventrals; ventrals mucronate, and posteriorly and laterally, they become spinose, as well as keeled; gular scales granular and pavemented, except along the gular fold, where they are elongated, mucronate, and heavily imbricate; frontal most often entire; postfemoral dermal pocket absent, but occasionally represented by a minor whorl of underdeveloped scales. Coloration (alcoholic) of male: dorsum of head, body and tail grayish, with four to six dark cross-bars, which are occasionally obliterated by a heavy deposition of dark melanins throughout the skin; the cross-bars are usually broken medially, and often alternate; dorsum of body and limbs often flecked with varying shades of gray or brown, lateral areas similar, but usually tinted with a bluish wash; venter of limbs, and interhumeral and interfemoral areas of varying shades of gray, but most often heavily flecked with darker gray or brown; ventral basal portion of tail gray to brown, flecked with darker; long, deep blue abdominal patches, which may or may not be overlaid with a heavy stippling of brown or dark gray; except for a median light area occasionally, the entire gular surface including the infralabials, is heavily mottled with black, gray, or brown. Smith (1935:170), reporting on freshly collected specimens from Morelos and Guerrero, says "the entire gular region is orange, coarsely reticulated or diagonally barred with black except in a large, round median area just anterior to the gular fold." Measurements of fifty adults, both sexes: head length 12.5 mm; head width, 10.6 mm; snout to vent, 52.5 mm; hind leg, 29.6 mm.

Distribution. Michoacán, Morelos, Puebla, and Guerrero west of Acapulco.

Remarks. Because Duméril designated only "Mexico" as the type locality for *bicarinatus*, and this only by inference, subsequent authors

have reported many specimens ostensibly of this species, from widely divergent points in Mexico (see Smith, 1935:171). Actually, as Schmidt (1921) pointed out, at least two of the populations of what had previously been accepted as *bicarinatus*, were referable to separate subspecies. It is therefore obvious that the majority of previously published records for *bicarinatus* are actually referable not only to this form, but to several others, which do not occur within the range of *bicarinatus*. Schmidt (*op. cit.*), Smith (*loc. cit.*), and I, have reviewed the populations of *bicarinatus*, and find, insofar as available material indicates, that *bicarinatus* is distributed as given above.

I have pointed out (1940:34) that specimens from the southern periphery of the range of *bicarinatus*, notably in the area between Acapulco and Tierra Colorada, Guerrero, differ from the more northerly population of this subspecies. Ultimately, in extreme southeastern Guerrero, and continuing eastward through most of Oaxaca to southwestern Chiapas, these lizards become clearly recognizable as a separate biological entity, and have been so designated (Mittleman, *loc. cit.*).

Smith (1935:171) reports "The species is apparently entirely arboreal. Some specimens were found on some of the large species of cactus of the genus *Opuntia*. Their coloration is extremely protective; they were frequently discovered only by striking likely-looking trees with a shovel or heavy stick. Usually two or more occurred together on the same tree or cactus."

Urosaurus bicarinatus anonymorphus Mittleman

1940 *Uta anonymorpha* Mittleman, Herpetologica **2**, (2): 34, pl. 3, fig. 2.
1941 *Uta bi-carinata anonymorpha* Mittleman, Jour. Wash. Acad. Sci., **31**: 71.

Type locality. Tehuantepec, Oaxaca, Mexico.

Type. USNM 46988, male.

Diagnosis. Enlarged vertebrals and the single series of enlarged dorsals commencing on the shoulders only slightly craniad of a line joining the anterior points of insertion of the fore-limbs; enlarged dorsals in a continuous series, or only barely encroached upon by a few of the small granules of the back; enlarged dorsals regularly arranged, forming parallel rows on opposite sides of the vertebrals, and not too strongly carinated; external to the enlarged dorsals is a sparse series of large scales, which are a trifle larger than the vertebrals but never approach the enlarged dorsals in size; this series of scales never in contact with the enlarged dorsals, but in contact at several points with the rather poorly developed dorsolateral series of tubercles and mucronate

scales, through the medium of small, elongate clusters of slightly enlarged, granular scales; thoracic tubercles not well developed, and not prominent; dorsolateral and lateral tubercles often not enlarged, and similarly often not in clusters, instead there is usually a single enlarged, tubercular scale, surrounded by a few mucronate, spinose, flat scales; ventrals mucronate and spinose, especially posteriorly; laterally, the ventrals become carinate and quite distinctly pavemented; gular scales granular, flat, and pavemented, except in the region of the fold, where they are elongate, spinose, lightly carinate, and imbricate; general appearance not very rugose; frontal always entire; postfemoral dermal pocket regularly lacking. Coloration (alcoholic) of male holotype: quite similar to that of *bicarinatus*, save that the ventral blue, or blue-black patches are very abbreviated and restricted to the pectoral area. Chin usually not so heavily maculated as in *bicarinatus;* occasional specimens are uniformly suffused with a deep blue-gray which completely obliterates any traces of the dorsal pattern. Measurements of holotype: head length, 11.5 mm; head width, 9.0 mm; snout to vent, 50.0 mm; hind leg, 27 mm.

Distribution. Guerrero, east of Tierra Colorada; Oaxaca, except the north-central portion; western Chiapas (Tonolá).

Remarks. At the time of original description of *anonymorphus* I postulated a probable subspecific relationship between this form and *bicarinatus.* Somewhat later (1941:72) I was able to report that such a relationship actually existed, as borne out by a series of 98 specimens taken by Dr. Hobart M. Smith from eastern Guerrero to Chiapas, as well as others from Morelos, western Guerrero, and elsewhere in the range of *bicarinatus.* Dr. Smith's fine series of specimens show that *bicarinatus* apparently terminates in the vicinity of Acapulco, Guerrero, and that in the relatively short distance from this city to Tierra Colorada, Guerrero, the transition from this form to *anonymorphus* takes place, with this latter subspecies becoming clearly recognizable from the vicinity of Tierra Colorada, and continuing southward and eastward. The extension of the range of *anonymorphus* to include Chiapas is on the basis of two specimens taken by Dr. Smith at Tonolá. While these two individuals possess certain aberrations which to a degree remove them from *anonymorphus,* they resemble this form most closely, and are considered to be such, at least until further specimens will have been taken from more easterly points in Chiapas.

Generally speaking, *anonymorphus* is quite easily separated from *bicarinatus.* In males, the abbreviated blue abdominal patches are quite distinctive in *anonymorphus;* while the ventral coloration tends

to take on the appearance of an evenly diffused wash in *bicarinatus* males. In specimens of either sex, *anonymorphus* can be identified at once by its much less rugose appearance, and the definitely weaker carination of the enlarged dorsals. More often too, *anonymorphus* will possess an evenly mottled chin, whereas *bicarinatus* has a tendency to possess a light median area, as has been noted by Smith (1935:170). The holotype and the paratypes on which *anonymorphus* is based, agree very well with the series of 98 specimens taken by Smith.

UROSAURUS BICARINATUS NELSONI Schmidt

1921 *Uta nelsoni* Schmidt, Amer. Mus. Nov., **22**: 4.

1941 *Uta bi-carinata nelsoni* Mittleman, Jour. Wash. Acad. Sci., **31**: 72.

Type locality. Cuicatlam (=Cuicatlán), Oaxaca, Mexico.

Type. USNM 46836, male.

Diagnosis. Most closely allied to *bicarinatus* and *anonymorphus*, from which races it differs only as follows: ventrals not mucronate; dorsolateral and lateral series of tubercles poorly developed; head narrower proportionately than in *bicarinatus*, and proportionately broader than in *anonymorphus;* enlarged dorsals smaller. Measurements of type: head length, 13.5 mm; head width, 10.5 mm; snout to vent, 58.0 mm; hind leg, 33.0 mm.

Distribution. Restricted to the type locality.

Remarks. I am familiar with *nelsoni* only through the type specimen, which is distinct enough from other subspecies of *bicarinatus*, as given above. I hesitate to postulate further on it, since it is so little known. My reasons for considering *nelsoni* a subspecies of *bicarinatus* have been previously (1941:73) given as follows: "*U. b. nelsoni* is designated as a subspecies of *bi-carinata* for the following reasons: The marked similarity in structure to the typical form and *anonymorpha;* the continuity and contiguity of its distribution with the *bi-carinata—anonymorpha* stock, the ranges of all three being juxtaposed; and the possibility that *nelsoni* represents an intermediate population in position between the *bi-carinata—anonymorpha* stock, and some form, as yet undescribed, from extreme northwestern Oaxaca and possibly southern Veracruz." Since the writing of the above passage, neither additional specimens nor information have come to hand, so that further investigation of this form must await additional, comparative material.

UROSAURUS BICARINATUS TUBERCULATUS Schmidt

1921 *Uta tuberculata* Schmidt, Amer. Mus. Nov., **22**: 4; Smith, Univ. Kan. Sci. Bull., 1935, **12** (7): 171.

1941 *Uta bi-carinata tuberculata* Mittleman, Jour. Wash. Acad. Sci., **31**: 73.

Type locality. Colima, State of Colima, Mexico.

Type. AMNH 13737, male.

Diagnosis. Most closely related to *bicarinatus*, from which it differs as follows: enlarged dorsals larger, more regularly arranged, and equal to or greater than the enlarged femorals and tibials; external to the enlarged dorsals, but in contact with them or separated by only one or two granules, is a series of slightly enlarged scales which are visibly keeled, but neither so large nor so prominent as the primary dorsals; dorsolateral and lateral tubercles and enlarged spinose scales very regularly arranged, but not so prominent as in *bicarinatus;* lowest series of tubercles in contact with the ventrals which are not sharply differentiated from the granular scales of the sides; ventrals rounded, occasionally submucronate; slightly keeled laterally; gular scales elongate and imbricate, except those immediately adjacent to the infralabials, where they are granular and pavemented; frontal variable, usually divided; postfemoral dermal pocket variable, occasionally present; coloration similar to *bicarinatus*. Measurements of type: head length, 12.0 mm; head width, 9.0 mm; snout to vent, 45.0 mm; hind leg, 27.0 mm.

Distribution. Discontinuous, recorded from Colima and Jalisco (Schmidt, *loc. cit.*); Presidio de Mazatlán, Sinaloa (Smith, 1935:171) 20 miles southeast of Alamos, Sonora (Mittleman, 1941:73).

Remarks. "Other than some slight variation in color and pattern, the specimens I have seen agree rather well with the type, differing only in a few minor points.

"Because of a dearth of Utas from southern Sonora to central Jalisco, the distribution of *tuberculata* is imperfectly known. First known from Jalisco and Colima, the type series remained unique until Smith (*loc. cit.*) reported a specimen taken by him just south of Presidio de Mazatlán, Sinaloa, which extended the range northward for about two hundred miles. In the course of an examination of Mexican Utas in the collection of the Museum of Comparative Zoölogy I came upon two specimens, MCZ nos. 37856–7, collected near Guirocaba, 20 miles southeast of Alamos, Sonora. These two specimens are quite typical of the subspecies, and on the basis of their locality, the range

of *tuberculata* is extended northward again for another two hundred and eighty miles. Dr. Smith tells me in a letter that this closely corresponds to the distributional pattern of *Sceloporus nelsoni*.

"*U. b. tuberculata* is obviously a member of the neotropical *bicarinata* stock; just what its relationships with the nearactic *lateralis* might be must await the discovery of further specimens from Sinaloa, southern Sonora, and northern Jalisco." (Mittleman, 1941:73–74).

Urosaurus unicus Mittleman

1879 *Uta bicarinata* Cope, Proc. Amer. Phil. Soc., **18**: 261; Bull. U. S. Nat. Mus., 1887, **32**: 35; Amer. Nat., 1896, **30**: 1020; Rept. U. S. Nat. Mus. 1898 (1900):320.

1941 *Uta unica* Mittleman, Jour. Wash. Acad. Sci., **31** (2): 74, figs. 1c, 2, 3.

Type locality. (?) Batopilas, Chihuahua, Mexico.

Type. USNM 14248, female.

Diagnosis. "Cephalic scales comparatively smooth; frontal entire, separated behind from the interparietal by a pair of frontoparietals; rostral much wider than high; supralabials 5–5, the fourth and fifth subocular in position; infralabials 7–7; auricular opening anteriorly denticulated by several enlarged, granular scales; a few scattered enlarged scales on the nape and shoulders, extending caudad from a point just posterior of a line joining the anterior insertions of the fore limbs, along the vertebral line onto the base of the tail for a distance subequal to the length of the femur, is a series of enlarged scales, bordered on each side by a single series of much larger scales, which are, however, inferior in size to the enlarged scales of the femur, but larger than the enlarged tibial scales; enlarged dorsal scales only weakly carinated, and prominently pavemented; external to the enlarged scales and in contact with them, or more often separated by the width of the vertebral series, is another series of enlarged scales, spaced about two scale lengths apart; these latter equal to or slightly smaller than the enlarged scales bordering the vertebral series; the outer enlarged scales often surrounded by minutely enlarged tubercular scales; on the dorsolateral, lateral, and ventrolateral areas are evenly dispersed four longitudinal series of small clusters of slightly enlarged, somewhat convex scales, which are not at all rugose; the lowermost of these rows of clusters barely in contact with the ventrals; ventral scales imbricate and mucronate anteriorly, but medially, laterally, and

posteriorly, they become rounded and quite pavemented, again becoming spinose and imbricate as they approach the anal region; ventrals abruptly diminishing in size to meet the lateral scales; gular scales pavemented and rounded anteriorly, but mucronate and imbricate posteriorly, and noticeably increasing in this tendency, until in the region of the gular fold the scales are longer than wide and distinctly spinose; gular fold extending laterally and dorsally around the anterior edge of the insertions of the fore limbs, and met by a heavy postauricular fold; caudal scales large, prominently keeled, spinose, and at least basally, in irregular whorls of three verticils, of which the first is always prominently largest; postfemoral dermal pocket absent. Coloration of holotype (alcoholic): Dorsum of head and body greenish gray, the head finely reticulated with light brown, and the body with two light brown bands which are narrow on the vertebral line and widen as they progress laterally; dorsum of the body irregularly flecked and barred with dark brown; axillary, inguinal, lateral, prehumeral, posthumeral, and postanal regions washed with dark brown; an irregular dark brown pectoral blotch; gular area and the remainder of body and tail venter a very pale greenish gray; limbs narrowly barred with light brown. Cope (*loc. cit.*) [1900:322] describes the specimen which was then fresh, as having "limbs and tail shaded with reddish brown," and says further that the "inferior regions tinted yellow lightly stippled with brown; males have the entire abdominal region bluish gray." Measurements of holotype: Snout to posterior border of ear, 11.5 mm; head width, 9.0 mm; snout to vent, 50.0 mm; hind leg (insertion to tip of 4th toe, exclusive of nail), 26.5 mm; tail 52.0 mm." (Mittleman, *Loc. cit.*)

Distribution. At present known only from extreme southwestern Chihuahua.

Remarks. This very unique species is quite different from other known *Urosaurus*, and as far as I am able to determine, it represents a dwarf offshoot of a probable pre-*tuberculatus* stock. Its distinctness indicates a considerable age, and long separation from other members of the genus.

When I recently described the species on the basis of the sole specimen known, I presented all of the available data on its provenance, simply that it was collected in Chihuahua, Mexico, by Edward Wilkinson. Since then, certain data have accumulated, to some degree circumstantial, which appear to indicate that the type locality of *unicus* is properly Batopilas, Chihuahua. Because several other genera and species of reptiles were probably collected at the same locality and

time by Wilkinson, and because data on these forms have been similarly lacking, I present a brief summary of what is known concerning these animals, as well as *unicus*.

The first published reference to a herpetological collection made by Edward Wilkinson, is that of Cope's (1879:261). Here Cope lists eight species of lizards, and seven of snakes, all taken at Batopilas, Chihuahua. Included in this list is "*Uta bicarinata*" with which form Cope later (1900:320) confused the specimen now designated as the type of *U. unicus*. Somewhat later, Cope again made reference to the Batopilas collections of Wilkinson, and said (1887:35), "*Uta bicarinata* Duméril... Batopilas, Chihuahua, *Wilkinson*. City of Chihuahua, Wilkinson..." Still another reference to the "*bicarinata*" and the Batopilas collection was made (1896:1020), when Cope mentioned "A small collection made by Wilkinson in southern Chihuahua at Batopilas has the character of the Chihuahuan fauna, with the following species not otherwise found in it . . . *Uta bicarinata* Dum." Finally, Cope says (1900:322) of "Uta bicarinata", "This species occurs throughout Mexico, as far north as the City of Chihuahua, where it was obtained by Mr. Edward Wilkinson." However, on the page preceding, the figure of Cope's "*bicarinata*" (fig. 43), based on USNM 14248, now the type of *unicus*, bears only the legend "Chihuahua, Mexico."

I think the preceding quotations and references show that there can be little doubt that the origin of *unicus* is Batopilas. Cope's last reference to "bicarinata" from the City of Chihuahua is certainly attributable to one of his careless oversights. Either he mistakenly considered a specimen of another *Urosaurus* from the City of Chihuahua to be one of his "*bicarinata*", which does not seem likely, or else he confused the locality data of his specimen, which was probably shipped to the National Museum from this city, although collected at Batopilas. Furthermore, in Cope's original paper on Wilkinson's Batopilas collections (1879:262) appears the description of a new species, *Procinura aemula*, which Cope later refers to as *Scolecophis aemulus* (1900:1109), and which, significantly enough, he says was collected at Batopilas. Since the *Procinura* or *Scolecophis* was originally listed with the "*Uta bicarinata*" as having been taken at Batopilas, and the reference again given at a later date, Cope's other references to "*bicarinata*" from as far north as the City of Chihuahua are plainly explicable as stated above. In view of extensive collections throughout the greater part of Mexico, which indicate that *bicarinatus* does not range anywhere near the City of Chihuahua, or even in the state itself, and further, since Chihuahua is known to possess several

forms of *Urosaurus*, except in the southwestern corner from whence no specimens have been available (other than *unicus* if it was actually taken there), in the light of the evidence adduced, I consider Batopilas as the type locality of *unicus*.

As a further matter of record, it may be stated that through some sort of agreement between Cope and Wilkinson, the collections of the latter went to Cope through the National Museum, probably to avoid payment of duties. Also, Wilkinson made at least two other collections, in the vicinity of the City of Chihuahua, for *Trimorphodon vilkinsonii* was taken there, and described by Cope in 1885, while a single bird egg is catalogued in the National Museum as having been taken in the Sierra Eulalia, near the City of Chihuahua, Wilkinson, collector, 1886. Naturally, there is the possibility of Wilkinson's having spent several years collecting throughout Chihuahua, and sent several collections from different points within the state. Cope apparently kept all the Wilkinson specimens in his personal collection for some time, and then donated them to the National Museum, and catalogued them all at once. This is corroborated by the fact that all Wilkinson specimens are catalogued in the National Museum under the numbers 14222–14310. Since the "*Uta bicarinata*" and other specimens reported by Cope in 1879, as well as the type of *Trimorphodon vilkinsonii* which was collected several years later are all catalogued together, it bears out the contention that the numerous specimens were deposited in the National Museum simultaneously. Incidentally, Cope, by previous arrangement with Wilkinson apparently, sent him twenty of the specimens after they had been catalogued (Nos. 14257, two specimens; 14263–4; 14270; 14274; 14276; 14281–2; 14296, six specimens; 14303, five specimens). For none of these is there any information as to provenance or identity. They have never been located, although there is some reason to believe that they may be housed with some of Wilkinson's personal effects (if they are indeed still in existence) in the Mansfield (Ohio) Memorial Museum.

Summary of the *bicarinatus* Complex

The several species and subspecies which are here included in the *bicarinatus* complex have common bonds by reason of the frontal which is nearly always entire, the usual lack (or only rudimentary development) of the postfemoral dermal pocket, and chiefly, the single principal row of enlarged dorsals on either side of the vertebrals.

With the exception of *unicus*, whose phyletic relationships and derivation can only be hazarded hypothetically, the constituent forms of the complex are closely united, and differ only in degree, rather than kind. They occur, more or less continuously, from southern Sonora along western Mexico to western Chiapas.

The neotropical *bicarinatus* complex appears to have been directly derived from *schottii*, or a pre-*schottii* form, at about the time of the early Miocene, and must have then invaded the newly emerged land lying to the south of what is now Sinaloa, for prior to this era, most of west-coast Mexico from northern Sinaloa to Jalisco, and south to the Yucatan Peninsula, was inundated. The divergence of the complex has been hampered only by the high Sierra Madre del Occidental to the east, and the Pacific Ocean on the west. The sole member of the complex which occurs anywhere other than on the Mexican mainland (*auriculatus*, of Socorro Island), is an ancient relict form, whose appearance has been most fortuitous (see discussion of *clarionensis* and the *ornatus* complex).

With the exception of *unicus*, which for the present can only be dismissed as a relict end-form, the *bicarinatus* group has resulted through direct orthogenetic activity, and the constant drive into previously unoccupied territory, accompanied by genic changes within successive end populations. There is little apparent difference in the ecology of the several forms, so that it can only be assumed that constant differences and the comparative lack of wide intergradation are due to physiological barriers, rather than ecological and/or geographic ones.

The complex has formed in the line *auriculatus-tuberculatus-unicus-bicarinatus-nelsoni* and *anonymorphus*, the last two possibly having occurred simultaneously. In this line, we find that the postfemoral dermal pocket is variable in *auriculatus* and *tuberculatus*, absent in *unicus*, nearly always absent or at best rudimentary in *bicarinatus*, and always lacking in *nelsoni* and *anonymorphus*. Similarly, from north to south, the trend is from a fairly rounded, smooth ventral, to a mucronate or spinose, and carinated one. In the progression from north to south, the frontal assumes a more stable character, so that ultimately in *nelsoni* and *anonymorphus* only an occasional aberrant possesses a divided frontal.

It seems entirely within reason to expect the occurrence of still another *Urosaurus* in eastern Chiapas. I have mentioned that specimens of *anonymorphus* from Tonolá are aberrant. In addition, it may be pointed out that the general region including eastern Chiapas was separated from the Tehuantepecan area by a post-Miocene immersion,

and did not emerge and become continuous again until the Pliocene, thus affording ample time for the differentiation of another race, especially if an endemic population remained. A similar case in point has been found in *Cnemidophorus* (Burt, 1931:73).

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EXPLANATION OF PLATES

PLATE 1

PLATE 1

Urosaurus ornatus ornatus Baird and Girard, cotypes, USNM 2750, Rio San Pedro, Val Verde County, Texas.

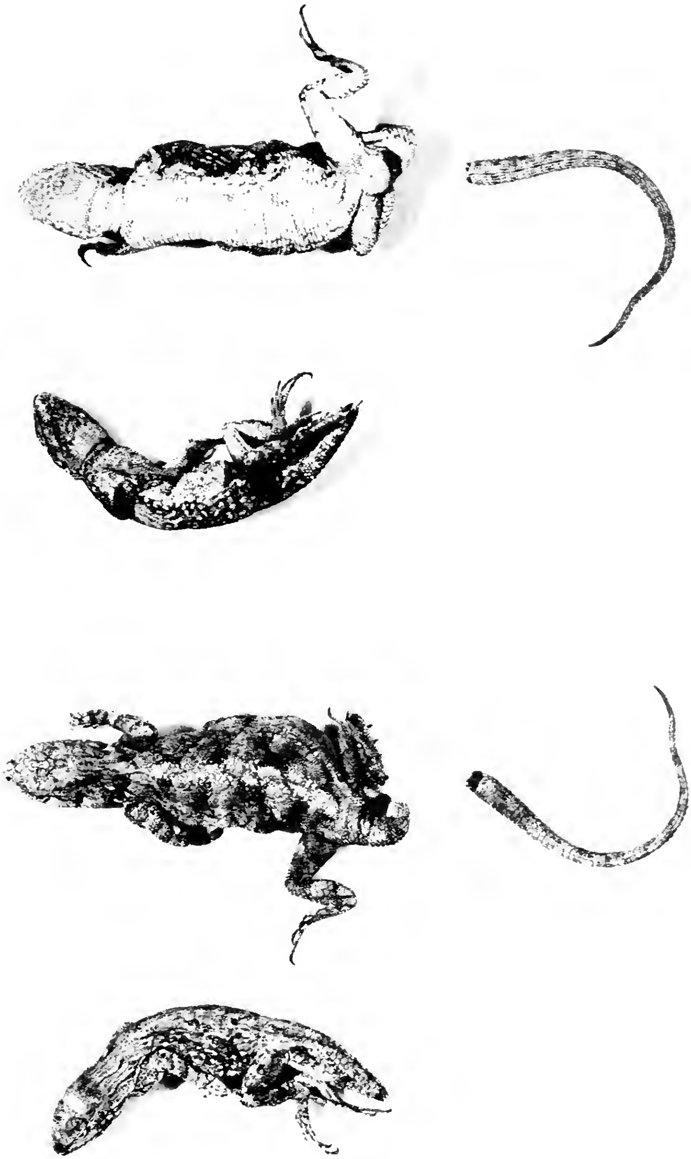


PLATE 2

PLATE 2

Urosaurus ornatus schmidti Mittleman, type, USNM 32929, Fort Davis, Jeff Davis County, Texas.

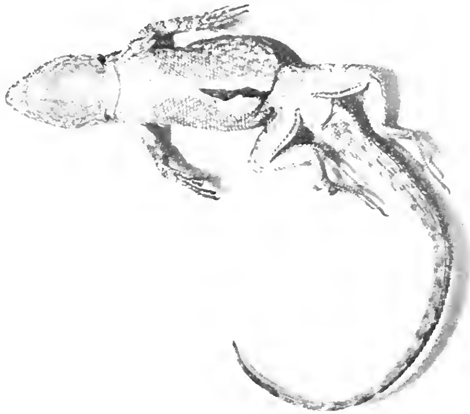


PLATE 3

PLATE 3

Urosaurus ornatus linearis Baird, neotype, USNM 62077, Los Nogales, Sonora, Mexico.

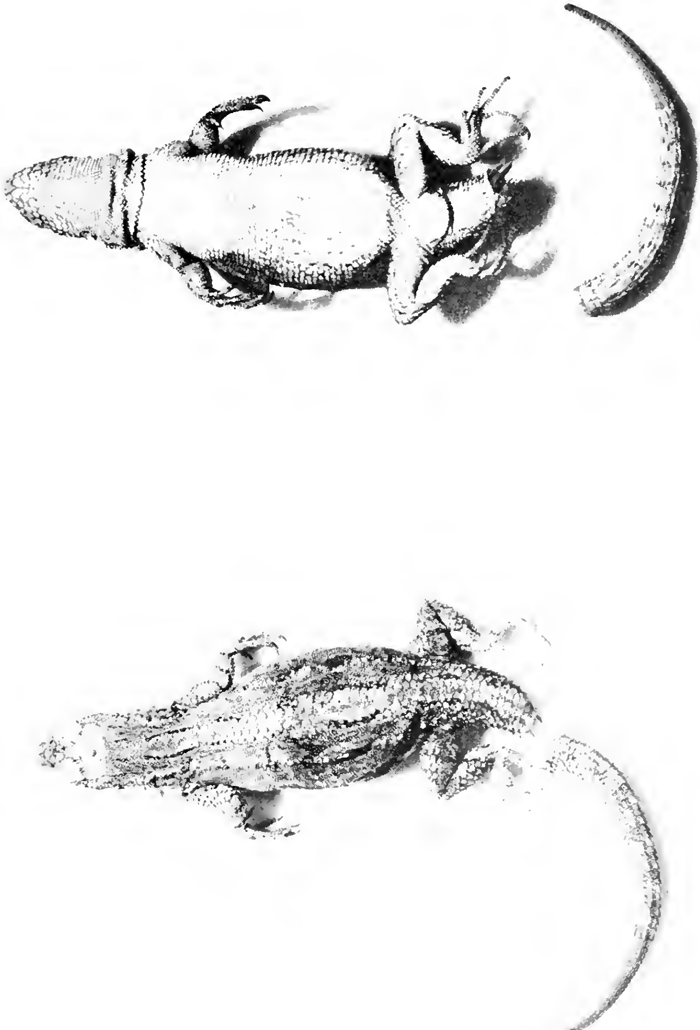


PLATE 4

PLATE 4

Urosaurus ornatus symmetricus, neotype, USNM 2744a, Fort Yuma, Imperial County, California.

PLATE 5

PLATE 5

Urosaurus ornatus chiricahuae Mittleman, type, MVZ 7751, Pinery Cañon, Chiricahua Mountains, 6000 ft., Cochise County, Arizona.

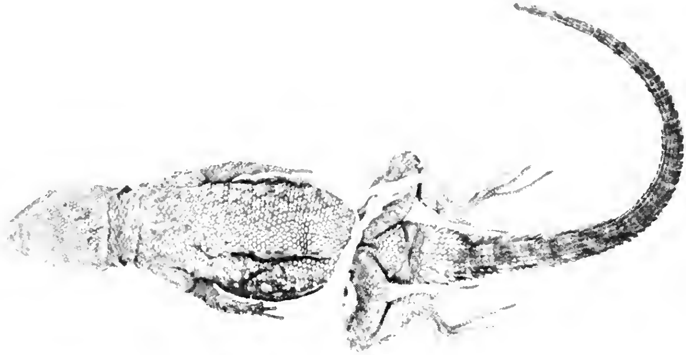


PLATE 6

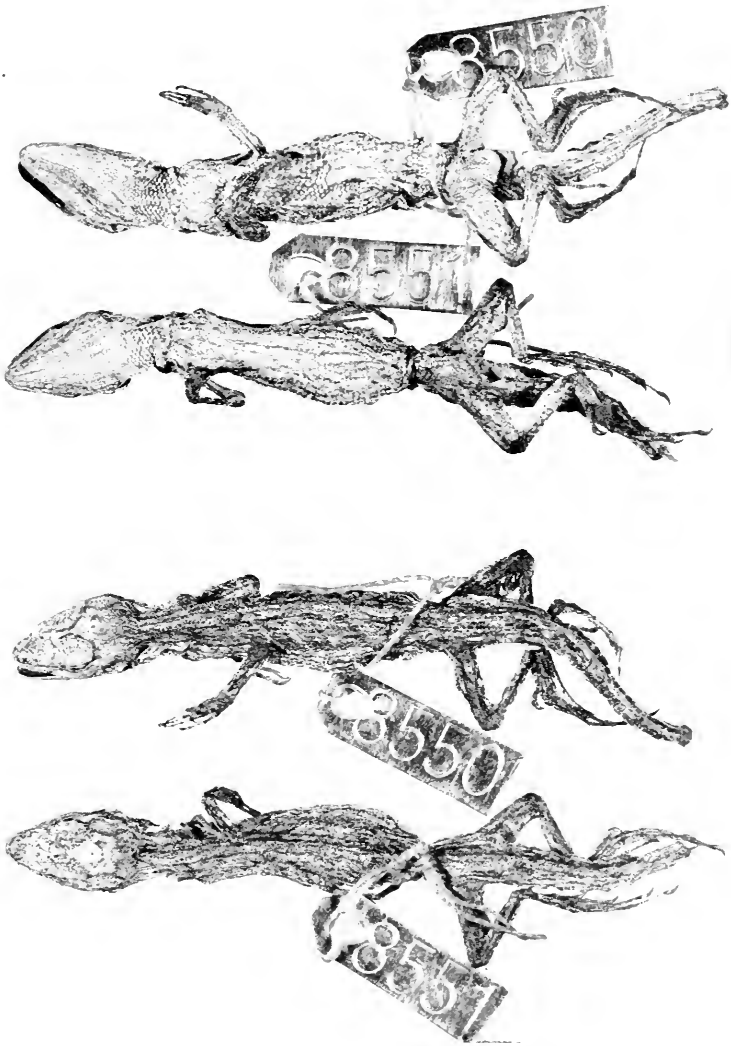
PLATE 6

Urosaurus ornatus levis Stejneger, type, USNM 11474, Tierra Amarilla, Rio Arriba County, New Mexico.

PLATE 7

PLATE 7

Urosaurus ornatus graciosus Hallowell, cotypes, ANSP 8550–1, Lower California (=Southern California).



3550
3551
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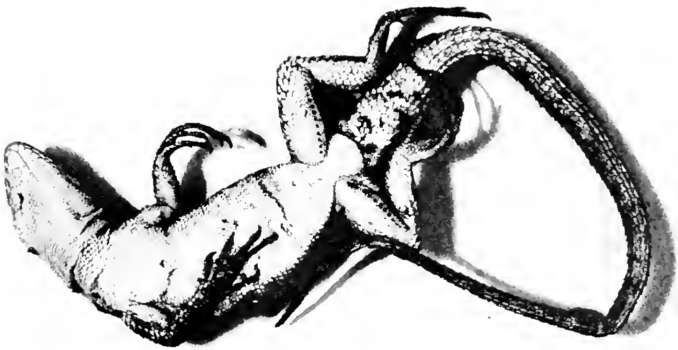
PLATE 8

PLATE 8

Urosaurus clarionensis Townsend, type, USNM 15904, Clarion Island, Revillagigedo Archipelago, Mexico.



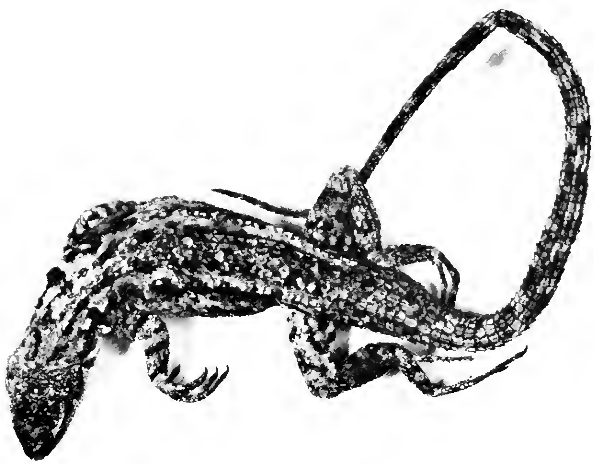


PLATE 9

PLATE 9

(Top) *Urosaurus ornatus wrighti* Schmidt, CAS 3759, Moab, Grand County, Utah.

(Bottom) *Urosaurus ornatus caeruleus* Smith, type, David H. Dunkle—Hobart M. Smith Coll. No. 132, 30 miles north of Chihuahua City, Chihuahua, Mexico.

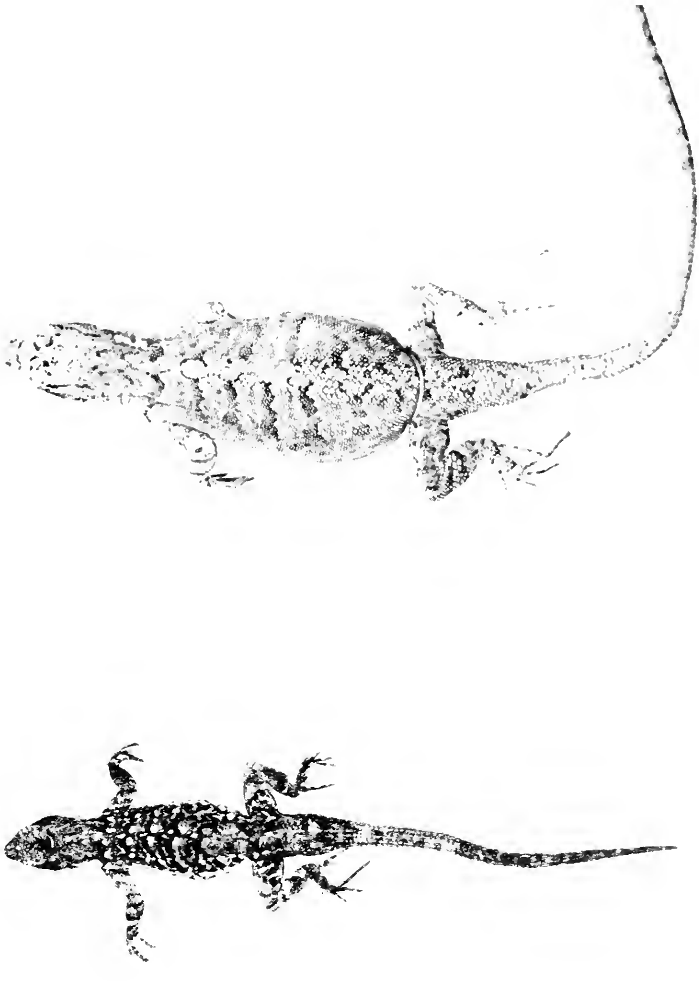


PLATE 10

PLATE 10

Urosaurus nigricaudus Cope, cotype, USNM 5307, Cape San Lucas, Baja California, Mexico.

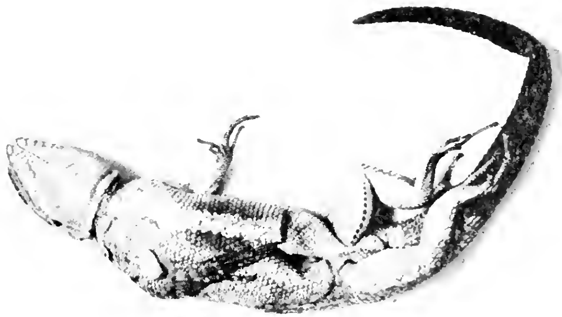


PLATE 11

PLATE **11**

Urosaurus gadovi Schmidt. USNM 113421, Apatzingan, Michoacán.

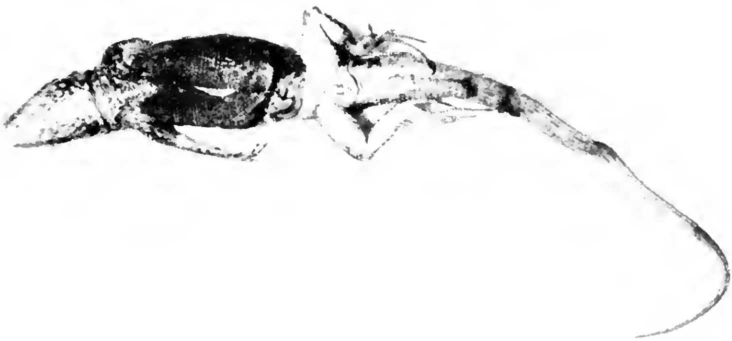


PLATE 12

PLATE **12**

(Top) *Urosaurus irregularis* Fischer, type, Municipal Natural History Collection of Bremen No. 437, ". . . aus dem Hochlande von Mexico." (from Fischer, 1882, pl. 17)

(Bottom) *Urosaurus bicarinatus tuberculatus* Schmidt, Edward H. Taylor Coll. No. 552, Presidio de Mazatlán, Sinaloa, Mexico.

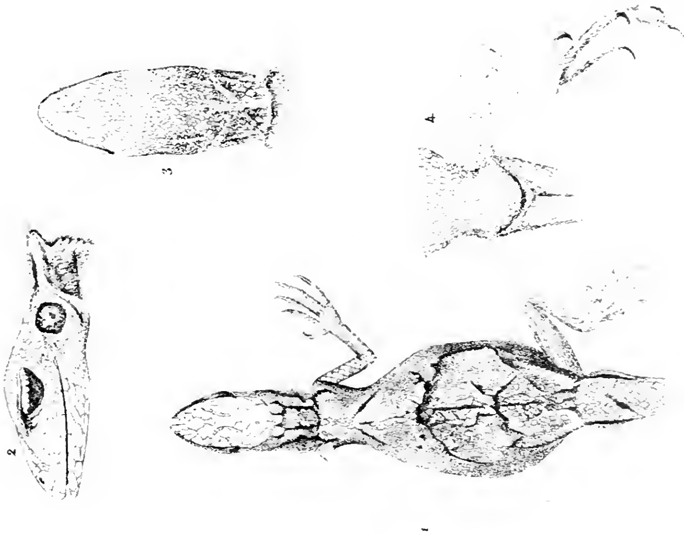


PLATE **13**

PLATE 13

Urosaurus bicarinatus bicarinatus Duméril, USNM 10242, Tupataro, Michoacán, Mexico.

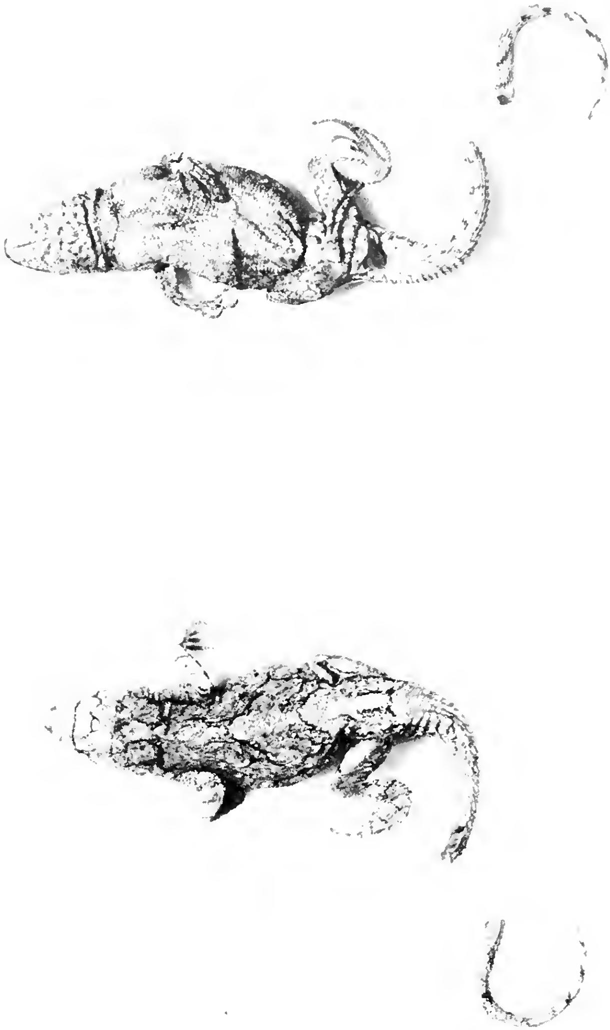


PLATE 14

PLATE **14**

Urosaurus bicarinatus anonymorphus Mittleman, type, USNM 46988, Tehuantepec, Oaxaca, Mexico.

PLATE 15

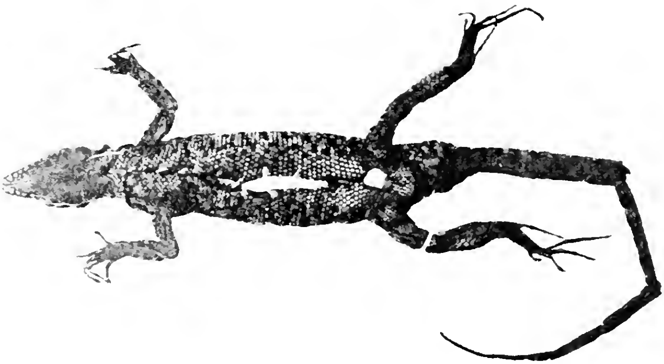
PLATE **15**

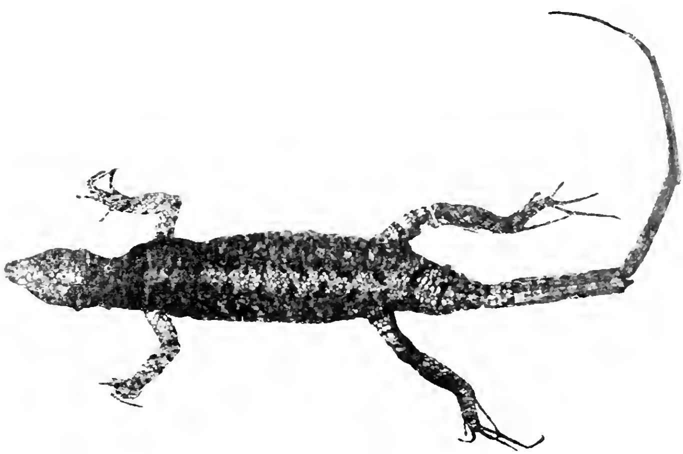
Urosaurus bicarinatus nelsoni Schmidt, type, USNM 46836, Cuicatlán, Oaxaca, Mexico.

PLATE 16

PLATE 16

Urosaurus auriculatus Cope, type, USNM 7027, Socorro Island, Revillagigedo Archipelago, Mexico.





Bulletin of the Museum of Comparative Zoölogy

AT HARVARD COLLEGE

Vol. XCI, No. 3

SCIENTIFIC RESULTS OF A FOURTH EXPEDITION TO FORESTED AREAS IN EASTERN AFRICA

III

DECAPOD CRUSTACEA

By Fenner A. Chace, Jr.

CAMBRIDGE, MASS., U. S. A.

PRINTED FOR THE MUSEUM

October, 1942

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE

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III

Decapod Crustacea

By Fenner A. Chace, Jr.

The decapod Crustacea collected by Mr. A. Loveridge consist of 389 specimens belonging to 20 species, nine of which are coastal and marine species and the remainder fresh-water crabs. Two of the latter, referred to the subgenus *Geothelphusa* of the genus *Potamon*, are here described as new. As the number of known species of Potamonidae from Africa increase, their determination becomes more and more difficult, and so it was decided to draw up a list of the species which have been recorded from Africa in the hope that such a summary will save future workers a little of the time spent in locating species scattered through the literature. Although Parisi (1923, p. 334) has published a list of the species of Potamonidae of the world described since Miss Rathbun's monograph (1904–1906), it can do no harm to bring this list up to date for the African forms. The structure of the first abdominal appendage of the male is becoming increasingly important among the Brachyura as a diagnostic character, so the liberty has been taken here to figure this appendage from a few of the type specimens of African potamonids in the Museum of Comparative Zoölogy; the determination of the species of this group, as in most of the families of fresh-water Crustacea, is so difficult that it is only by frequent reference to the types that synonymies can be satisfactorily straightened out.

PENAEIDAE

Penaeus indicus H. Milne Edwards

Penaeus indicus H. Milne Edwards, 1837, Hist. Nat. Crust., **2**, p. 415.
Peneus indicus Alcock, 1906, Catal. Ind. Dec. Crust., pt. 3, fasc. 1, p. 12, pl. 1, figs. 3, 3a.
Peneus indicus Schmitt, 1926, Biol. Res. Fish. Exp. F.I.S. "Endeavour", **5**, pt. 6, p. 359.

1 ♂ 6 ♀ (M. C. Z. 11220) Kilindini, Mombasa Id., Kenya Colony. 25. vii. 39.

In all of these adult specimens in which the rostrum is intact it extends beyond the antennal scales, but in at least one case it reaches only slightly beyond.

PAGURIDAE

Clibanarius longitarsus (de Haan)

Pagurus longitarsus de Haan, 1849, Faun. Japon. Crust., p. 211, pl. 50, fig. 3.
Clibanarius longitarsis Alcock, 1905, Catal. Indian Dec. Crust., pt. 2, fasc. 1, p. 158.
Clibanarius longitarsus Buitendijk, 1937, Temminckia, **2**, pp. 253 and 266.

1 ♂ 1 ♀ (M. C. Z. 11221) Mikindani, Tanganyika Territory. iv. 39.

POTAMONIDAE

Potamon (Potamonautes) hilgendorfi (Pfeffer)

Telphusa Hilgendorfi Pfeffer, 1889, p. 32.
Telphusa suprasulcata Hilgendorf, 1898, p. 8, pl., figs. 5-5d.
Potamon (Potamonautes) Hilgendorfi Rathbun, 1905, p. 171.
Potamon (Potamonautes) suprasulcatus Rathbun, 1905, p. 172.
Potamon (Potamonautes) suprasulcatum Colosi, 1924, p. 4.
Potamonautes hilgendorfi Balss, 1929b, p. 344.
Potamon (Potamonautes) hilgendorfi Rathbun, 1933, p. 256.
Potamon (Potamonautes) hilgendorfi Rathbun, 1935, p. 26.

3 immature ♀ (M. C. Z. 11222) Mt. Magrotto, near Muhesa, Tanganyika Territory. vii. 39.

Type localities. Stream near "Nekonda" and "Hanaha" stream near "Mangaala", both in Ungúu, Tanganyika Territory.

These three specimens, all of which are young females as indicated by the narrow abdomen, have the carapace ranging in breadth from 34 mm. to 47.6 mm. Comparison of these specimens with those collected by Mr. Loveridge at Amani in the Usambara Mts. and identified as *P. hilgendorfi* by Miss Rathbun, after examination of specimens of that species from the Hamburg Museum, discloses no differences of importance; in Amani specimens of similar size there is often a broad tooth at the end of the post-frontal crest. It is remarkable how similar in appearance young specimens of *P. hilgendorfi* are to *P. dybowskii* from the Belgian Congo; in fact, if the present specimens had come from the Congo, they could easily have been identified as the latter species. Compared with an adult female of *P. dybowskii*, the carapace differs only in the rougher post-frontal crest and anterolateral margins and the coarser transverse striae on the lateral portions of the carapace as well as the more granulated side walls; how-

ever, the carpal spine in *P. dybowskii* is followed by a series of denticles rather than a distinct spine as in *P. hilgendorfi*. It is very likely, as Balss (1929b) has pointed out, that *P. mrogoroensis* is synonymous with this species but the latter species has been retained in the list below in the hope that more conclusive proof of its identity with *P. hilgendorfi* will be forthcoming.

POTAMON (POTAMONAUTES) DYBOWSKII Rathbun

Potamon (Potamonautes) Dybowskii Rathbun, 1904, pl. 15, fig. 3; 1905, p. 177.
Potamon (Potamonautes) ambiguus Lenz, 1910b, p. 121. (Not *P. ambiguus* Rathbun, 1904. See Balss, 1929b, p. 345.
Potamonautes Dybowskii Balss, 1914a, p. 103.
Potamon (Potamonautes) dybowskii Rathbun, 1921, p. 410, text-fig. 7, pl. 24.
Potamon (Potamonautes) dybowskii Parisi, 1925, p. 99.
Potamonautes dybowskii Balss, 1929b, p. 345.
Potamon (Potamonautes) dybowskii Balss, 1936, p. 187, text-fig. 23 (map).

1 ♀ with young (M. C. Z. 11223) Goma, north end of Lake Kivu, Belgian Congo. 13–14. ii. 39.

Type locality. Bangui, French Equatorial Africa.

This specimen has a carapace breadth of 58.8 mm. The carapace appears rather worn so that all of the usually sharp angles have become blunt; the post-frontal crest consequently appears lower than is generally the case in this species and the teeth at the ends of that crest are indicated only by a concavity just inside the lateral margins. The specimen has been compared with a smaller female collected by Dr. J. C. Bequaert at the village of Malela (Chief of Kasende), 5° 40′ S., 23° 45′ E., Belgian Congo, and identified by Miss Rathbun. Despite the worn appearance of the Kivu specimen, there is little doubt that both individuals belong to the same species.

I find it impossible to agree with Dr. Balss (1936) that *P. stanleyensis* is a synonym of this species. There are at my disposal four paratypes of the latter species from Stanleyville, Belgian Congo. Aside from its smaller size (mature specimens compared), *P. stanleyensis* differs from *P. dybowskii* in having the carapace more convex antero-posteriorly, a much less prominent furrow dividing the branchial region, a distinct though smaller spine rather than a row of denticles following the carpal spine, the propodite of the last ambulatory leg more slender and very differently formed first abdominal appendages of the male as shown by Miss Rathbun (1921, text-figs. 7d and 9h).

POTAMON (POTAMONAUTES) LIRRANGENSIS Rathbun
Text-figure 1

Potamon (Potamonautes) lirrangensis Rathbun, 1904, pl. 14, fig. 8; 1905, p. 169
Potamonautes lirrangensis Balss, 1914b, p. 404.
Potamon (Potamonautes) lirrangensis Rathbun, 1921, p. 413, text-fig. 8, pls. 25 and 26, fig. 3.
Potamonautes lirrangensis Balss, 1929b, p. 347.
Potamon (Potamonautes) lirrangensis Balss, 1936, p. 188, text-fig. 24 (map).

1 ♂ (M. C. Z. 11224) Idjwi Island, Lake Kivu, Belgian Congo. ii. 39.

Type locality. Lirranga, at the junction of the Congo and Ubangi. Rivers, Belgian Congo.

This single specimen agrees more closely with the figure of the type from Lirranga than with specimens identified by Miss Rathbun from Stanleyville with which it was directly compared. The front in the

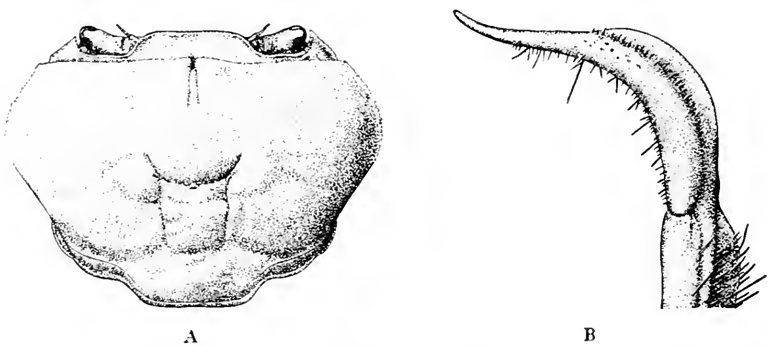


Fig. 1. *Potamon (Potamonautes) lirrangensis:* A, dorsal view of carapace of male from Idjwi Island, x 0.9; B, posterior view of end of first right abdominal appendage of the same specimen, x 9.

Idjwi specimen, and apparently also in the type, is nearly transverse anteriorly whereas in the Stanleyville specimens the front is markedly bilobate in both dorsal and frontal view. Rathbun (1921), in discussing the Stanleyville specimens, fails to mention this character except to say, "margin of frontal lobes rather regularly arched", but it is obvious from her figures that these specimens have the frontal margin deeply concave in the median portion. In all other particulars, including the form of the first abdominal appendage of the male, the present specimen agrees with the Stanleyville specimens; apparently the latter

represent but a local variety of the species. Balss (1929b and 1936) has recorded *P. lirrangensis* from Lake Kivu, but he fails to mention the form of the front in either paper.

POTAMON (POTAMONAUTES) USAMBARAE Rathbun
Text-figure 2

Potamon (Potamonautes) usambarae Rathbun, 1933, p. 257, pl. 6.

4 ♂ 2 ♀ (M. C. Z. 11225) Mt. Magrotto, near Muhesa, Tanganyika Territory. vii. 39.

Type localities. Amani and Kizerui, both in the Usambara Mountains, Tanganyika Territory.

These specimens agree very well with the male described and figured by Miss Rathbun from Amani. The male and ovigerous female from Kizerui, although probably the same species, have the

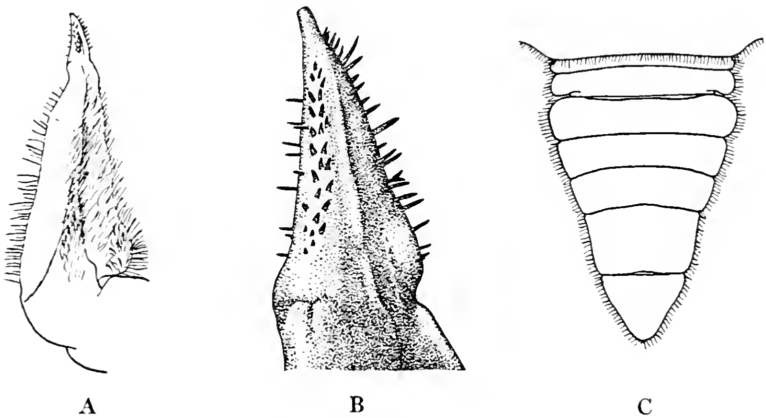


Fig. 2. *Potamon* ((*Potamonautes*) *usambarae;* A, posterior view of first right abdominal appendage of male cotype (carapace breadth 22.6 mm.) from Amani, x 7.3; B, posterior view of tip of same appendage, x 36.5; C, abdomen of same specimen, x 2.9.

carapace much less convex antero-posteriorly; this is particularly true of the female. This is probably not the species called *T. hilgendorfi* by Hilgendorf (1898) to which Miss Rathbun (1904) has already given the name *P. ambiguus* and which Balss (1929b) refers to *P. johnstoni*. *P. usambarae* is a much smaller species that *P. johnstoni* and an examination of the first abdominal appendages of the male discloses that, in this respect at least, it is not even closely related to the latter species (cf. Balss, 1936, text-fig. 17).

POTAMON (POTAMONAUTES) OBESUS (A. Milne Edwards)

Thelphusa obesa A. Milne Edwards, 1868, p. 86, pl. 20, figs. 1–4.
Potamon (Potamonautes) obesus Rathbun, 1904, pl. 15, figs. 8 and 9; 1905, p. 180, text-fig. 45.
Potamon (Potamonautes) obesus Sendler, 1912. p. 199.
Potamon (Potamonautes) obesus Bouvier, 1921, p. 49.
Potamonautes obesus Balss, 1929b, p. 348.
Potamonautes obesus Barnard, 1935, p. 484.

1 ♂ 1 ♀ (M. C. Z. 11226) Siga Caves, near Tanga, Tanganyika Territory. vi. 39.

Type locality. Zanzibar.

POTAMON (POTAMONAUTES) ALOYSII-SABAUDIAE Nobili

Text-figure 3

Potamon (Potamonautes) Aloysii Sabaudiae Nobili, 1906b, p. 1. (Corrected to *Aloysii-Sabaudiae* under "errata").
Potamon (Potamonautes) Aloysii Sabaudiae Nobili, 1909, p. 357.
Potamon (Potamonautes) johnstoni Calman, 1909, p. 51, text-figs. 9, 10 and 12 (not text-fig. 11).
Potamon (Potamonautes) Johnstoni Colosi, 1920, p. 32.
Potamon (Potamonautes) Johnstoni Colosi, 1924, p. 21, text-fig. 15.

3 ♂ 9 ♀ (1 ovigerous) (M. C. Z. 11227) Kibale Forest, Uganda. xii. 38.

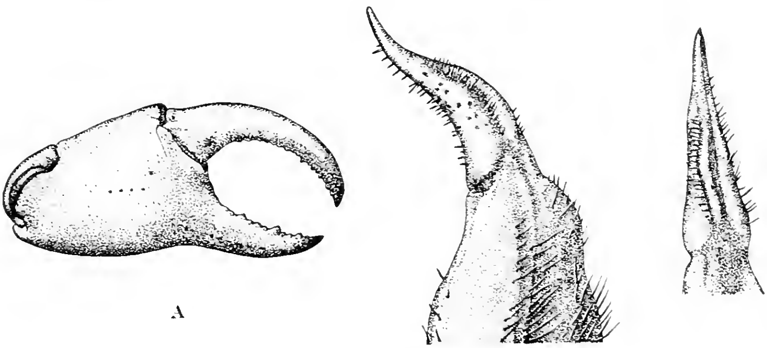
14 ♂ 28 ♀ (M. C. Z. 11228) Bundibugyo, Bwamba Forest, northwestern part of Mt. Ruwenzori, Uganda. 20. xii. 38.

16 ♂ 17 ♀ (2 ovigerous) 40 young (M. C. Z. 11229) Mihunga, Mt. Ruwenzori, Uganda. i. 39.

Type localities. Colosi (1920) gives Ibanda and "Bijunga (3505 m.)", Mt. Ruwenzori, as the localities of Nobili's types.

In spite of Calman's conviction that this species is identical with *P. johnstoni* from Mt. Kilimanjaro, it seems to me best at present to recognize both species. When more material is available from other localities, intermediate forms may be discovered which will prove without doubt that *P. aloysii-sabaudiae* is but a local race of *P. johnstoni;* in the meantime little is lost by considering the species as distinct. Calman has shown that in *P. johnstoni* the post-frontal crest is sharp even in males larger than any known Ruwenzori specimens, whereas in *P. aloysii-sabaudiae* it is broadly rounded in adult males. In females the crest is somewhat sharper than in males, particularly toward the lateral margins, but it becomes sharp for its

entire length, as in Kilimanjaro specimens, only in very immature individuals; this tendency for the post-frontal crest to become much sharper in young specimens is noticed in practically all species of the genus, even the most extreme forms of the subgenus *Geothelphusa* in which the crest is nearly absent in adults. Of even greater importance is the difference between the first abdominal appendages of the adult male. This difference can best be realized by comparing the accompanying figures with similar figures of a Kilimanjaro specimen of *P. johnstoni* in Balss (1936, text-fig. 17). In *P. aloysii-sabaudiae* the tip



A B C

Fig. 3. *Potamon (Potamonautes) aloysii-sabaudiae;* A, larger chela of male (carapace breadth 50 mm.) from Bundibugyo, x 1.1; B. posterior view of end of first right abdominal appendage of a male (carapace breadth 50.8 mm.) from Mihunga, x 15; C, antero-median view of end of same appendage, x 15.

curves outward much more strongly than in *P. johnstoni* and, as far as curvature is concerned, it is intermediate between *P. johnstoni* and *P. orbitospinus* as figured by Balss (1936, text-fig. 18). In addition, the tip of the appendage in dorsal, or antero-median, view differs considerably from the same surface of *P. johnstoni*. The specimens from the three localities listed above agree almost perfectly with the figure of the Ruwenzori specimen in Calman (text-fig. 9), but it is very difficult to believe that they also agree with the cotype of *P. johnstoni* (text-fig. 11). The present specimens, with due regard for characters which obviously change with increase in size, are similar to one another, except that the three largest males from Bundibugyo have the fingers of the larger chela widely gaping as in the accompanying figure; the others agree with Calman's figure of the chela (text-fig. 9).

Potamon (Geothelphusa) berardi (Audouin)?

Potamons or *crabes fluviatiles* Savigny, 1817, pl. 2, fig. 6.
Thelphusa Berardi Audouin, 1826, p. 82.
Potamon (Geothelphusa) Berardi Rathbun, 1904, pl. 18, figs. 3 and 10; 1905, p. 203.
Potamon (Geotelphusa) Berardi Lenz, 1910b, p. 124. (According to Balss, 1929b, these specimens are *P. emini*).
Potamon (Geothelphusa) Berardi de Man, 1914, p. 126, pl. 2, figs. 3–3a.
Potamon (Geothelphusa) Berardi Colosi, 1919, p. 50.
Potamon (Geotelphusa) Berardi Colosi, 1920, p. 34.
Geotelphusa berardi Balss, 1929b, p. 350.
Potamon berardi Flower, 1931, p. 732.
Potamon (Geothelphusa) berardi Rathbun, 1935, p. 25.

1 ♀ (M. C. Z. 11230) Idjwi Island, Lake Kivu, Belgian Congo. ii. 39.

Type locality. Egypt.

This specimen is distinguished from the two other species of the subgenus *Geothelphusa* taken at Idjwi Island, *P. (G.) idjwiensis* and *P. (G.) emini*, by the much less vaulted carapace. As the carapace is only 17.8 mm. broad and the individual is obviously nearly or quite mature, as indicated by the broadened abdomen, it apparently belongs to one of the smaller species of the genus; whether or not it should be assigned to *P. (G.) berardi* is open to argument, however. Although the form and areolation of the carapace is very like that of *P. (G.) berardi*, there are a few points of difference which should be mentioned. The carapace is like that figured by de Man (1914) from an Egyptian specimen, even to the dimple on either protogastric region, but the front is more strongly deflexed in the Idjwi specimen so that the margin is hidden from dorsal view. A comparison with Egyptian and Mount Elgon specimens available in the Museum of Comparative Zoölogy discloses the following differences in addition to the more deflexed front; the Idjwi specimen has the surface of the carapace much less grossly punctate and consequently it appears more glossy; the post-frontal crest is slightly more removed from the dorsal margin of the orbit than in the typical *P. (G.) berardi;* in frontal view, the orbits are more strongly convex below the outer angle and so appear to extend a little beyond this angle in the present specimen; finally, the ischium of the third maxillipeds of this specimen has a stronger longitudinal groove than in any of the specimens of *P. (G.) berardi* examined. In all other particulars the Idjwi speci-

men agrees with that species. Apparently the most closely related Congo species is *P.* (*G.*) *congoënsis*, but our specimen belongs to a somewhat smaller species and the post-frontal crest curves slightly forward at the outer ends rather than running obliquely backwards in nearly a straight line. It is likely that this female will prove to belong to a varietal form of *P.* (*G.*) *berardi*, but relationships may be so masked in female specimens that more material, including males, must be collected before its true position can be ascertained.

Potamon (Geothelphusa) emini (Hilgendorf)

Telphusa emini Hilgendorf, 1892, p. 11.
Potamon (*Geothelphusa*) *Emini* Rathbun, 1904, pl. 18, fig. 9; 1905, p. 209.
Potamon (*Geothelphusa*) *emini* Rathbun, 1909, p. 102.
Potamon (*Geotelphusa*) *Emini* Lenz, 1910b, p. 125.
Potamon (*Geothelphusa*) *Emini* Bouvier, 1921, p. 50, text-fig. 4.
Potamon (*Geothelphusa*) *Emini* Rathbun, 1922, p. 35.
Potamonautes emini Balss, 1929b, p. 345.
Potamon (*Geothelphusa*) *emini* (var. Bouvier) Rathbun, 1933, p. 258, pl. 4, figs. 1 and 2, pl. 5.
Potamon (*Geothelphusa*) *emini* Balss, 1936, p. 193, text-fig. 28 (map).

1 ♂ 1 ♀ (M.C.Z. 11231) Idjwi Island, Lake Kivu, Belgian Congo. ii. 39.

Type locality. Near Bukoba, northwestern Tanganyika Territory.

These specimens have been compared with those collected by Mr. Loveridge in the Uzungwe Mountains, Tanganyika Territory, and identified by Miss Rathbun (1933) as a variety of this species. The present specimens are very similar to that lot, differing only as follows: the outer orbital angles are more obtuse, less rectangular; the notch between the outer orbital angle and the end of the post-frontal crest is less deep, not V-shaped; the sharp portion at the outer end of the post-frontal crest runs back obliquely in an almost straight line rather than being concave forward; the diagonal grooves on the male sternum are similar but slightly stronger; and the fifth segment of the male abdomen has the sides slightly concave rather than slightly convex. The male has the carapace 17.4 mm. broad, the female 17.3 mm. broad.

Potamon (Geothelphusa) mutandensis, spec. nov.

Text-figures 4 and 5

Type ♂ (M. C. Z. 11232) Mushongero, Lake Mutanda, southwestern Uganda. 1. ii. 39.
14 ♂ 3 ♀ (1 ovigerous) (M. C. Z. 11232), same data.

Carapace relatively narrow, nearly three-fourths as long as broad, moderately convex in both directions and with the regions fairly well delimited. Surface with a few scattered punctae but more or less smooth and polished to the naked eye. Post-frontal crests discernible, but rounded off so that they are more or less indistinct in the

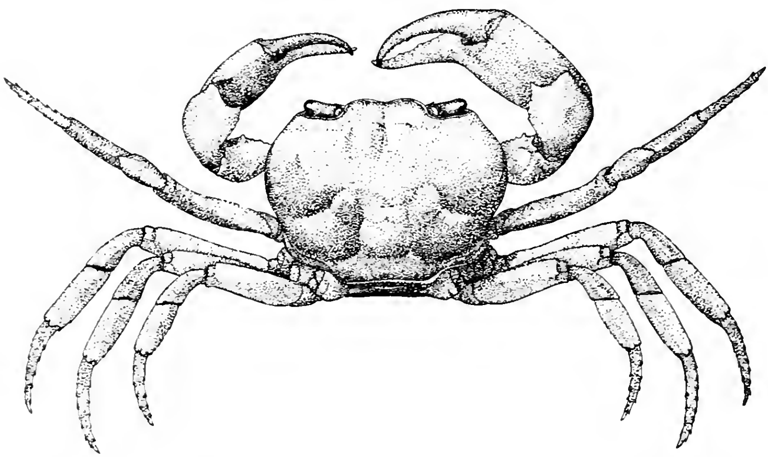


Fig. 4. *Potamon (Geothelphusa) mutandensis;* male holotype, x 1.3.

adult except for the protogastric prominences; the crests are more prominent with a tendency to become sharp-edged in females and young. Anterior mesogastric region roof-shaped and marked off by a very faint line which may extend nearly to the frontal margin, but is usually almost invisible. A rather deep, H-shaped depression delimits the posterior gastric and cardiac regions from the branchial region, and there is a broad depression separating the branchial region into two parts; this last depression usually, but not always, curves down onto the side wall sufficiently to make the postero-lateral margin slightly concave. Front typically strongly bilobed in dorsal view and turned

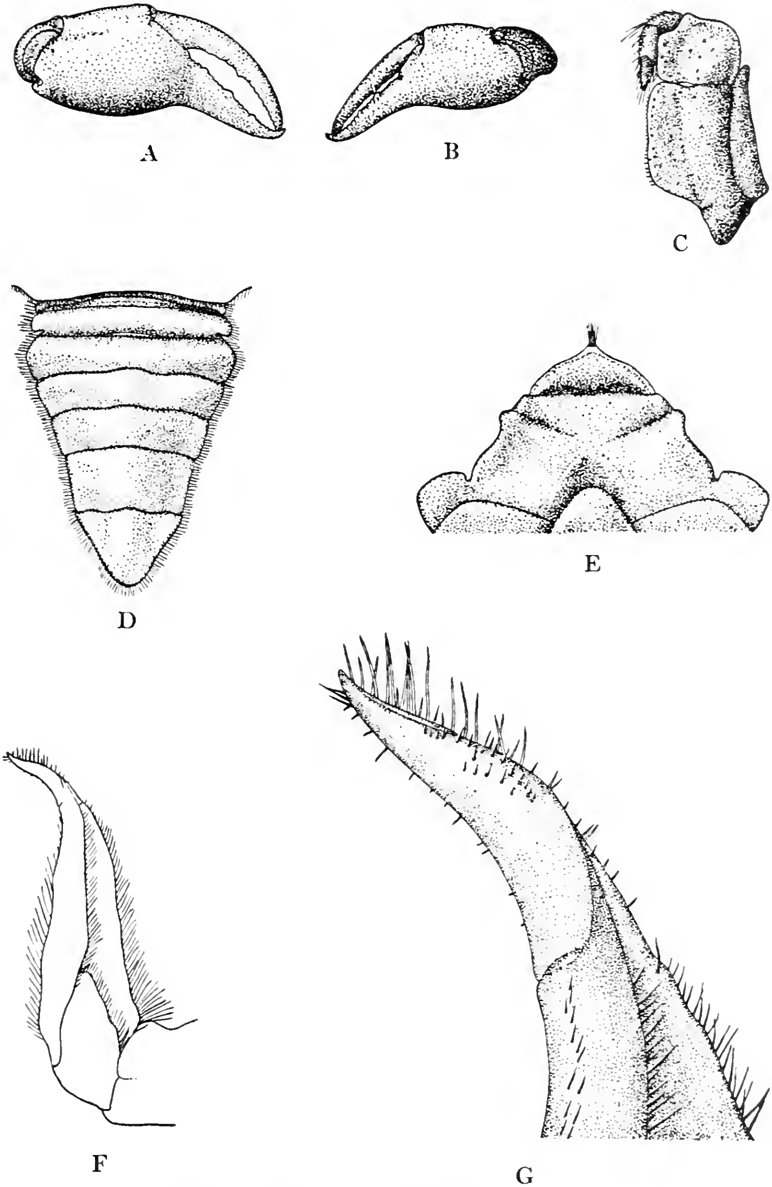


Fig. 5. *Potamon (Geothelphusa) mutandensis;* A, right chela of holotype, x 1.5; B, left chela of holotype, x 1.5; C, outer maxilliped of holotype, x 3.8; D, abdomen of holotype, x 3; E, anterior portion of sternum of holotype, x 3; F, posterior view of first right abdominal appendage of male paratype, x 7.5; G, posterior view of tip of same appendage, x 30.

down so that the frontal margin is just visible; in a few of the specimens, however, the frontal outline is nearly straight, and the downward curvature is subject to some variation. Viewed from in front, the frontal margin is either slightly convex or strongly bilobed. Upper margin of orbit slightly sinuous and nearly transverse, but tending to run obliquely outward and forward; outer angle obtuse and not prominent; no sinus below outer angle. Antero-lateral line of carapace slightly raised only near the orbital angle in adults, but more prominent for its entire length in the very young; it is slightly constricted at the juncture with the post-frontal crest. In the adult the carapace extends but little, if at all, laterally beyond the antero-lateral line at the widest point of the carapace.

Mandibular palp two-jointed, with the terminal joint simple. There is a faint oblique groove on the ischium of the third maxillipeds; outer margin of merus broadly rounded; exognath with a well-developed, plumose palp.

Chelipeds unequal, usually strikingly so in adult males in which the larger chela has the fingers widely gaping and crossing each other to such a degree in certain cases that they have a deformed appearance; the smaller chela is slender with very long fingers; in the females, and occasionally in males, the chelae are sub-equal. Both chelipeds have the merus ornamented on the anterior border with a row of tubercles, the most distal of which is enlarged and placed on a slightly lower level than the rest; on the proximal portion of the dorsal surface there may be a few scattered tubercles. Carpus with a short, stout inner spine followed by two or three tubercles.

Anterior of the sternal grooves complete and well marked; posterior groove distinct in its lateral portions, interrupted centrally. The margin of the sternum at the point of insertion of the chelipeds is slightly, but not abnormally, raised.

Sixth somite of male abdomen fully twice as broad at base as long and with very slightly sinuous margins. Terminal somite distinctly longer that the preceding, its base extending laterally slightly beyond the distal margins of the sixth and its margins very slightly concave. Extremities of first abdominal appendages of male turned strongly outward.

Measurements. Male holotype, length of carapace 19.0 mm., breadth 25.6 mm.; ovigerous female, length of carapace 15.0 mm., breadth 20.9 mm.

There is so much variation in this species as regards the areolation of the carapace, the form of the front and the degree of dissimilarity

between the chelae that it is not only difficult to determine the relationship between it and other species, but it is even possible that the species has been previously described from one of its forms. The species to which it might be most closely related include *P. neumanni*, *P. lactabilis*, *P. amalerensis*, *P. berardi*, *P. emini*, *P. congoënsis*, *P. perparvus*, *P. granviki* and *P. odhneri*. It is a smaller species than *P. neumanni* and the sixth abdominal somite in the male is not more than half as long as broad at the base as in that species. This latter character, the length of the penultimate abdominal somite, serves to distinguish *P. mutandensis* from *P. lactabilis*, *P. amalerensis* and *P. congoënsis*. The narrower carapace, blunter post-frontal crest and different form of the major chela of the male further distinguish this species from *P. amalerensis*. The carapace is less noticeably punctate and more strongly areolated and the form of the smaller chela and the first abdominal appendages of the male are different from those of *P. berardi*. It is a somewhat larger species than *P. emini* and the carapace is less swollen and more sharply areolated. The post-frontal crest is blunter than in *P. congoënsis* and the chelae are different. The transverse branchial furrow is more pronounced than in *P. perparvus* and the post-frontal crest is less distinct laterally. The first abdominal appendages of the male are different from those of *P. granviki* and, finally, the post-frontal crest is less distinct than that of *P. odhneri*.

Potamon (Geothelphusa) idjwiensis, spec. nov.

Text-figures 6 and 7

Type ♂ (M. C. Z. 11234) Idjwi Island, Lake Kivu, Belgian Congo. ii. 39.

89 ♂ 106 ♀ (11 ovigerous, 1 with young) (M. C. Z. 11235), same data.

Carapace very convex antero-posteriorly and very broad, being about two-thirds as long as broad in the adult. Branchial regions swollen. Surface grossly punctate. Post-frontal crests nearly obsolete, being represented by faint swellings denoting the epigastric lobes and obscure depressions behind the orbits which delimit very faint convexities in back of them. Depression behind gastric region well marked and cardiac region outlined. No cervical groove except for an almost invisible row of elongate pits. There are four irregular pits on either side of the widest portion of the mesogastric region and an indistinct pit behind each orbit in line with the extremity of the cornea. Median frontal groove well marked; anterior meso-

gastric region very narrow and obscurely delimited. Edge of front hidden from dorsal view, sinuous with a slight notch in the midline. Upper margin of orbit nearly transverse in dorsal view; outer angle obtuse and not prominent; there is no outer sinus; orbital margin raised and nearly smooth for its entire extent. Anterolateral line of carapace raised and crenulate in the young, scarcely distinguishable in the adult; it forms an obtuse angle at the end of the indistinct post-frontal crest. Postero-lateral border short and very faintly concave. The side wall of the carapace is so swollen that it extends laterally far beyond the antero-lateral line in the adult.

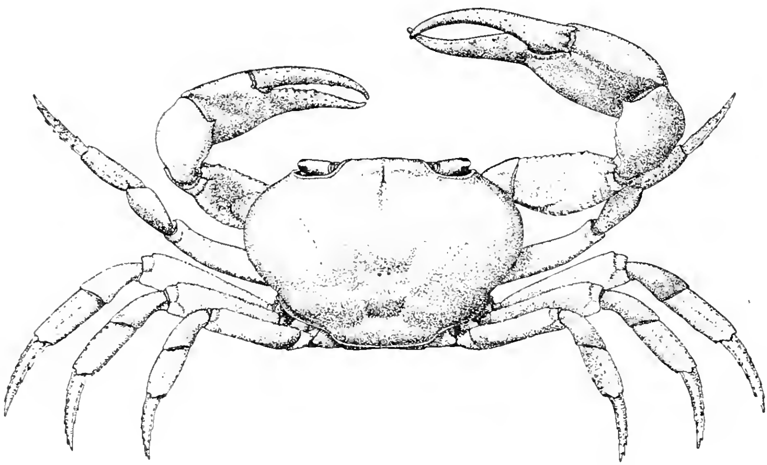


Fig. 6. *Potamon* (*Geothelphusa*) *idjwiensis;* male holotype, x 1.

Mandibular palp two-jointed with the terminal joint simple. There is a groove on the ischium of the outer maxilliped, nearer the inner than the outer margin; outer margin of merus angulate and forming a similar obtuse angle with the anterior margin; exognath with a long, plumose palp.

Chelipeds unequal; anterior margin of merus decorated with a row of small tubercles, one of which near the anterior end is more prominent; carpus with a well developed spine followed by a low denticulate ridge. Larger chela broadly gaping in the larger males.

Transverse groove on sternum between the bases of the outer maxillipeds very deep except near the margin where it becomes

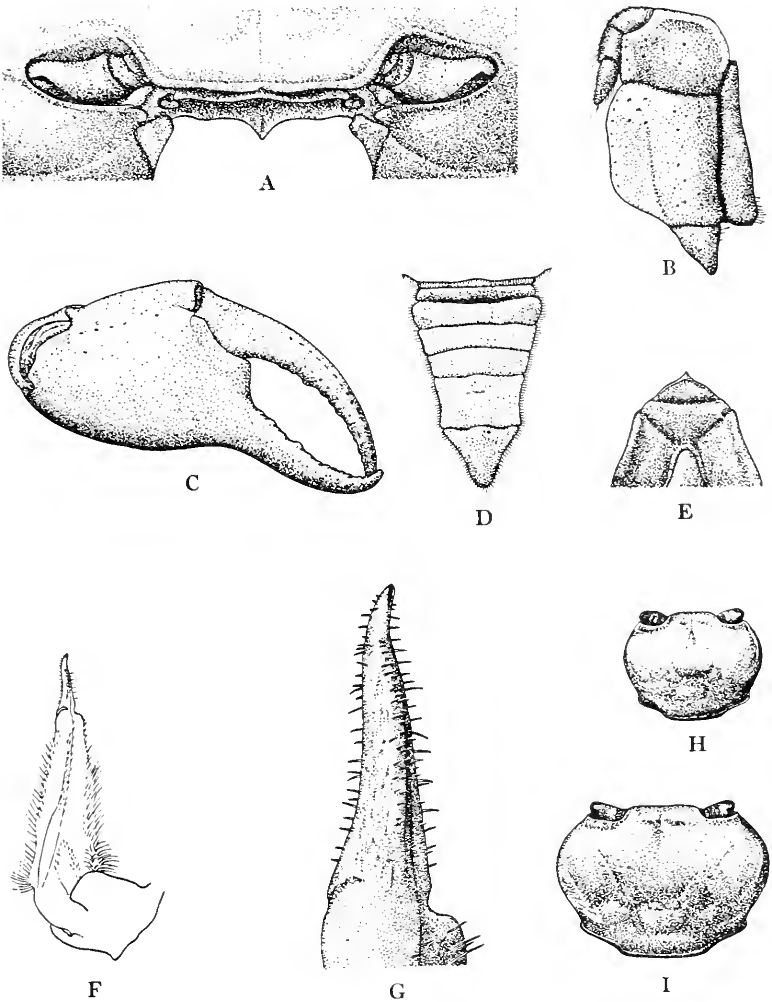


Fig. 7. *Potamon (Geothelphusa) idjwiensis;* A, fronto-orbital region of holotype, x 1.4; B, outer maxilliped of holotype, x 3.4; C. larger chela of holotype, x 1.4; D, abdomen of holotype, x 1.4; E, anterior portion of sternum of holotype, x 1.4; F, posterior view of first right abdominal appendage of male paratype, x 3.4; G, posterior view of tip of same appendage, x 17; H, carapace of young paratype (13.8 mm. broad), x 1.4; I, carapace of male paratype (21.0 mm. broad), x 1.4.

shallower. Behind the transverse groove are a pair of similar furrows running from in front of the bases of the chelipeds obliquely back to the ridge bounding the terminal segment of the abdomen; there is a tubercle near the anterior end of each of these oblique grooves. The margin of the sternum at the insertion of the chelipeds is raised to form a broad ridge.

Sixth somite of male abdomen with slightly concave lateral margins; sides of terminal segment more strongly concave. Extremities of first abdominal appendages of male more or less parallel to the midline, curving inwards slightly at the tips.

The following are the most noticeable changes which accompany growth in this species: the carapace becomes broader and extends proportionately farther beyond the antero-lateral line due to the greater inflation of the sub-branchial regions; the antero-lateral line becomes less and less distinct; the carapace becomes slightly more convex antero-posteriorly, but the edge of the front is concealed from dorsal view even in the young; and the eyes decrease in size. Young specimens may be distinguished from the two other Idjwi Island species of the subgenus *Geothelphusa* by the fact that the front is evenly convex in dorsal view — not bilobed.

Measurements. Male holotype, length of carapace 25.8 mm., breadth 37.5 mm.; ovigerous female, length of carapace 22.8 mm., breadth 32.0 mm. Old males in which the fingers are widely gaping have the carapace from 34.1 to 38.7 mm. broad. In females, the abdomen becomes broadened for the reception of the eggs when the carapace is about 25 mm. broad and ovigerous specimens have the carapace from 27.7 to 36.2 mm. broad; the specimen carrying young beneath the abdomen has a carapace breadth of 30.8 mm.

This species agrees very closely with the original description of *P. neumanni*, but the figures of the cotype of that species given by de Man (1914) leaves little doubt that it is not the same species. *P. idjwiensis* has the carapace broader, protruding farther beyond the antero-lateral line, the front curved downward more strongly so that the edge is hidden from dorsal view, the sub-hepatic and sub-branchial regions are less areolated, the terminal segment of the male abdomen is more concave along the lateral margins and the larger chela of the male is higher in proportion to its length.

Deckenia mitis Hilgendorf

Deckenia mitis Hilgendorf, 1898, p. 24, fig. 8.
Deckenia mitis Rathbun, 1905, pl. 21, fig. 7; 1906, p. 71, text-fig. 123.
Deckenia imitatrix, var. *mitis* Bouvier, 1921, p. 57.
Deckenia mitis Rathbun, 1921, p. 434, text-fig. 16, pl. 34.
Deckenia mitis Colosi, 1924, p. 19.
Deckenia mitis Balss, 1929b, p. 353.
Deckenia mitis Rathbun, 1933, p. 259.

1 ♂ 1 ♀ (M. C. Z. 11236) Siga Caves, near Tanga, Tanganyika Territory. vi. 39.

Type localities. Wembere Steppe (north of Tabora) and Dar-es Salaam, Tanganyika Territory, and Mombasa, Kenya Colony.

GRAPSIDAE

Grapsus strigosus (Herbst)

Cancer strigosus Herbst, 1799, Krabben u. Krebse, Bd. 3, Hft. 1, p. 55, pl. 47, fig. 7.
Grapsus strigosus Tesch, 1918, Siboga-Exped., Monogr. 39^{c}, p. 71, pl. 4, figs. 1 and 4.

2 ♂ (M. C. Z. 11237) Mikindani, Tanganyika Territory. iii. 39.

Sesarma (Sesarma) meinerti de Man

Sesarma meinerti de Man, 1887, Zool. Jahrb., Bd. 2, pp. 648 and 668.
Sesarma (Sesarma) meinerti Tesch, 1917, Zool. Med. Mus. Leiden, Deel 3, pp. 171 and 246.
Sesarma meinerti Cott, 1930, Proc. Zool. Soc., London, for 1929, pp. 679–692, 4 text-figs., 1 col. pl.
Sesarma (Sesarma) meinerti Miyake, 1938, Annot. Zool. japon., p. 108.

3 ♂ (M. C. Z. 11238) Mbanja, near Lindi, Tanganyika Territory. iv. 39.

A chela taken from the stomach of a crocodile (*Crocodylus niloticus*) captured at Mbanja has been identified as belonging to this species. Mr. Loveridge informs me that the stomach of this crocodile was filled with the remains of this crab.

OCYPODIDAE

Ocypode ceratophthalma (Pallas)

Cancer ceratophthalmus Pallas, 1772, Specilegia Zool., **9**, p. 83, pl. 5, figs. 7–8.
Ocypoda ceratophthalma Cott, 1930, Proc. Zool. Soc., London, for 1929, pp. 755–765, 1 text-fig., 1 pl.

2 ♂ 2 ♀ (M. C. Z. 11240) Lindi, Tanganyika Territory. 31. v. 39.

All of these specimens are small and the prolongation of the eye-stalk is as yet little more than an acute tubercle.

Ocypode kuhlii de Haan

Ocypode (Ocypode) kuhlii de Haan, 1835, Fauna Japon. Crust., p. 58.
Ocypode kuhlii Rathbun, 1935, Bull. Mus. Comp. Zoöl., **79**, no. 2, p. 26.

3 ♂ 2 ♀ (M. C. Z. 11241) Lindi, Tanganyika Territory. 31. v. — 4. vi. 39.

Uca annulipes (H. Milne Edwards)

Gelasimus annulipes H. Milne Edwards, 1837, Hist. Nat. Crust., **2**, p. 55, pl. 18, figs. 10–13.
Gelasimus annulipes Alcock, 1900, Journ. Asiat. Soc. Bengal, **69**, pt. 2, no. 3, p. 353.

2 ♂ (M. C. Z. 11242) Lindi, Tanganyika Territory. 31. v. 39.

Uca inversa (Hoffmann)

Gelasimus inversus Hoffmann, 1874, Crust. Echinod. Madagascar, p. 19, pl. 4, figs. 23–26.
Uca inversa Rathbun, 1935, Bull. Mus. Comp. Zoöl., **79**, no. 2, p. 27.

1 ♂ (M. C. Z. 11243) Lindi, Tanganyika Territory. 31. v. 39.

Uca marionis (Desmarest)

Gelasimus Marionis Desmarest, 1825, Consid. Gen. Crust., p. 124, pl. 13, fig. 1.
Uca marionis McNeill, 1920, Rec. Austr. Mus., **13**, p. 105, pl. 19, text-figs. 1–5.

3 ♂ (M. C. Z. 11244) Lindi, Tanganyika Territory. 31. v. 39.

All three of these specimens belong to the variety *nitida* of Dana.

List of African Fresh-water Crabs (Potamonidae) Known up to January 1, 1938

In the following list the subgenus has been omitted except in the synonymies. Although the definitions of the subgenera as generally recognized may be open to question, there is little doubt that subgenera of some sort are useful in clarifying the relationships of the Potamonidae; but, since several species have been referred to more than one subgenus by different authors and since this list makes no attempts to solve such problems except when material of a particular species is at hand, it is hoped that less confusion will result from retaining the subgenera only in the synonymy than by arbitrarily choosing one of the two or three that may have been employed by previous authors. For much the same reason, all forms are treated as full species even though they were described or subsequently referred to as subspecies or varieties. The state of our knowledge of specific relationships is so incomplete at present that a form now considered a subspecies may eventually be given full specific rank, while the species to which it was thought to be closely related may become a subspecies or variety of some entirely different form.

The original plan for this list called for the inclusion of the known range of each species, but it soon became apparent that the task of checking all of the localities was hardly worth-while when one considered the many inaccuracies unavoidably introduced into the results through the numerous misidentifications in the literature. In order to furnish some idea of the region in which each species is found and to aid future collectors in obtaining desirable topotypic material, the type locality has been noted wherever possible. I wish to take this opportunity to sincerely thank Mr. A. Loveridge and Dr. J. C. Bequaert for their able assistance in checking many of these localities.

Although many workers since the publication of Miss Rathbun's monograph have considered *Potamon* a neuter noun, it is here considered masculine. In its original spelling the word must have been derived from *ποταμων*, a masculine proper noun, even though its connotation must remain obscure.

The references given below include, in addition to the original one, only those which have appeared since Miss Rathbun's monograph (1904–1906); all other earlier references may be obtained from that work.

POTAMONIDAE

POTAMONINAE

POTAMON

Potamon africanus (A. Milne Edwards)

Thelphusa africana A. Milne Edwards, 1869, p. 186, pl. 11, figs. 2, 2a.
Potamon (Potamonautes) africanus Rathbun, 1904, pl. 16, fig. 6; 1905, p. 188, text-fig. 47.
Potamon (Potamonautes) africanum Colosi, 1920, p. 34.
Potamon (Potamonautes) africanum Colosi, 1924, p. 21, text-fig. 16.
Potamon (Potamonautes) africanum Roux, 1927, p. 237.
Potamonautes africanus Balss, 1929a, p. 124, text-figs. 5–7.
Potamonautes africanus Balss, 1936, p. 166.

Type locality. Gabon, French Congo.

Potamon alluaudi Bouvier

Potamon (Potamonautes) Alluaudi Bouvier, 1921, p. 46, text-figs. 1–3.

Type locality. Amboni River (alt. 1,800 m.), western part of Mt. Kenya, Kenya Colony.

This species is considered a synonym of *P. neumanni* by Balss (1929b).

Potamon aloysii-sabaudiae Nobili

See page 190.

Potamon amalerensis Rathbun

Text-figure 8

Potamon (Geothelphusa) amalerensis Rathbun, 1935, p. 25, pl. 2.

Type locality. Amaler River (5,000 ft.), Mt. Debasien, Uganda.

Potamon ambiguus Rathbun

Telphusa Hilgendorfi Hilgendorf, 1898, p. 9, pl., fig. 3. Not *T. hilgendorfi* Pfeffer (1889).
Potamon (Potamonautes) ambiguus Rathbun, 1904, pl. 14, fig. 7; 1905, p. 171.
Potamon (Potamonautes) ambiguus Lenz, 1910b, p. 121. (These specimens should be referred to *P. dybowskii* according to Balss (1929b).

Miss Rathbun's original specimens came from the Lumi (Loumi) River, Mt. Kilimanjaro, Tanganyika Territory, and Bura (Boura) in the Taita Mountains and Kibwezi, Kenya Colony.

Bouvier (1921), after comparing the types of *P. ambiguus* with a figure of the type of *P. johnstoni*, concluded that this is a synonym of the latter species and Balss (1929b) has concurred in this.

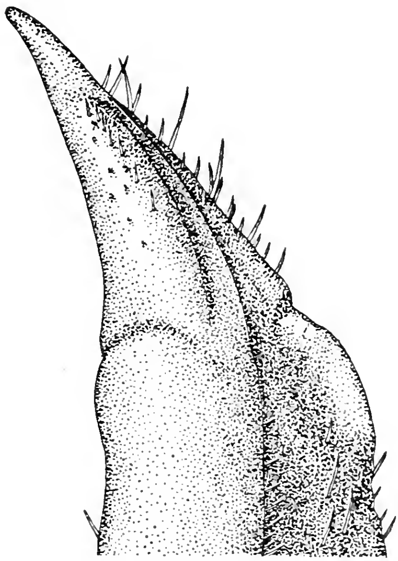


Fig. 8. *Potamon (Geothelphusa) amalerensis.* Posterior view of tip of first abdominal appendage of male holotype. x 40.

Potamon anchietae (Capello)

Telphusa Anchietae Capello, 1871, p. 132, pl. 2, fig. 11.
Potamon (Potamonautes) Anchietae Rathbun, 1905, p. 166.
Potamon (Potamonautes) anchietae Sendler, 1912, p. 199.
Potamonautes anchietae Balss, 1929a, p. 117.

Capello's original specimens came from Dondo, Pungo-Andongo and Ambaca, Angola.

Doflein (1904) and Colosi (1920 & 1924) considered this species synonymous with *P. perlatus*, but Balss (1929a) retains it as a distinct species and synonymizes *P. regnieri* with it.

Potamon ankaraharae Nobili

Potamon (Geothelphusa) ankaraharae Nobili, 1906a, p. 1, text-figs. A-C.
Parathelphusa (Barythelphusa) Ankaraharae Colosi, 1920, p. 22.
Potamon (Geotelphusa) ankaraharae Balss, 1929b, p. 356.

Type locality. "Ankarahara", Madagascar.

P. methueni is a synonym of this species according to Colosi (1920) and Balss (1929b).

Potamon antheus Colosi

Potamon (Geothelphusa) Antheus Colosi, 1920, p. 35.
Potamon (Geothelphusa) Anteus Colosi, 1924, p. 17, text-fig. 12, pl. 1, fig. 6.
Geotelphusa antheus Balss, 1929b, p. 351, text-fig. 1.

Type locality. Southwestern Ethiopia.

Potamon antongilensis Rathbun

Potamon (Parathelphusa) antongilensis Rathbun, 1905, p. 265, pl. 14, fig 5.
Potamon (Geotelphusa) antongilensis Balss, 1929b, p. 355, text-fig. 2.

Type locality. Antongil Bay, Madagascar.

Potamon aubryi (H. Milne Edwards)

Thelphusa Aubryi H. Milne Edwards, 1853, p. 210.
Potamon (Potamonautes) Aubryi Rathbun, 1904, pl. 17, figs 3, 4 & 7; 1905, p. 191.
Potamon (Potamonautes) Aubryi Doflein, 1904, p. 105.
Potamonautes aubryi Stebbing, 1910, p. 294.
Potamonautes aubryi Balss, 1914a, p. 104.
Potamonautes aubryi Balss, 1914b, p. 405.
Potamon (Potamonautes) aubryi Roux, 1927, p. 237.
Potamonautes aubryi Balss, 1929a, p. 122, text-figs. 2–3.

Type locality. Gabon, French Congo.

Potamon ballayi (A. Milne Edwards)

Thelphusa Ballayi A. Milne Edwards, 1886, p. 149.
Potamon (Potamon) Ballayi Rathbun, 1904, p. 294, pl. 12, fig. 9.
Potamon (Potamon) ballayi Rathbun, 1921, p. 419, text-fig. 10, pls. 27 and 28, fig. 1.
Potamonautes ballayi Balss, 1936, p. 174, text-fig. 9–13.

Type locality. Nganchu ("Ngancin"), French Congo.

Potamon bayonianus (Capello)

Telphusa Bayoniana Capello, 1864, p. 2, pl., fig. 3.
Potamon (Potamonautes) Bayonianus Rathbun, 1904, pl. 15, fig. 1; 1905, p. 178.
Potamonautes bayonianus Balss, 1922, p. 72.

Type locality. Duque de Bragança district, Angola.

Potamon berardi (Audouin)

Potamons or *crabes fluviatiles* Savigny, 1817, pl. 2, fig. 6.
Thelphusa Berardi Audouin, 1826, p. 82.
Potamon (Geothelphusa) Berardi Rathbun, 1904, pl. 18, figs. 3 & 10; 1905, p. 203.
Potamon (Geotelphusa) Berardi Lenz, 1910b, p. 124. (These specimens are *P. emini* according to Balss, 1929b, p. 345.)
Potamon (Geothelphusa) Berardi de Man, 1914, p. 126, pl. 2, figs. 3–3a.
Potamon (Geotelphusa) Berardi Colosi, 1919, p. 50.
Potamon (Geothelphusa) Berardi Colosi, 1920, p. 34.
Geotelphusa berardi Balss, 1929b, p. 350.
Potamon berardi Flower, 1931, p. 732.
Potamon (Geothelphusa) berardi Rathbun, 1935, p. 124.

Type locality. Egypt.

Potamon biballensis Rathbun

Telphusa Anchietae var. ? Capello, 1871, p. 132, pl. 2, fig. 11a.
Potamon (Potamonautes) biballensis Rathbun, 1905, p. 176.
Potamonautes biballensis Balss, 1936, p. 169, text-figs. 4–5.

Type locality. Biballa, Angola.

Potamon bipartitus (Hilgendorf)

Telphusa bipartita Hilgendorf, 1898, p. 15.
Potamon (Potamonautes) bipartitus Rathbun, 1905, p. 174.

Hilgendorf's original specimens came from the Belgian Congo at Alibuaki, west of the Issango River; Ali stream, Undussuma district; Bundeko; and Koganos.

Potamon bombetokensis Rathbun

Potamon (Potamon) bombetokensis Rathbun, 1904, p. 298, text-fig. 30, pl. 12, fig. 6.
Potamon (Potamon) bombetokensis Balss, 1929b, p. 354.

Type locality. Near "Bombetok", Madagascar.

Potamon bottegoi de Man

Potamon (Potamonautes) Bottegoi de Man, 1898, p. 262, pl. 3.
Potamon (Potamonautes) Bottegoi Rathbun, 1905, p. 180.
Potamon (Potamonautes) Bottegoi Colosi, 1925, p. 2.
Potamon (Potamonautes) Bottegoi Parisi, 1925, p. 98.
Potamon (Potamonautes) bottegoi Rathbun, 1933, p. 258.
Potamon (Potamonautes) bottegoi Rathbun, 1935, p. 26.

Type locality. "Matagoi Bool", between Brava and Lugh, Italian Somaliland.

Comparison of a male specimen of *P. obesus* from Zanzibar, the type locality of that species, with the several specimens from Kenya and Uganda identified as *P. bottegoi* by Miss Rathbun leads me to agree with Balss (1929b) that this species should be synonymized with *P. obesus*.

Potamon bouvieri Rathbun

Potamon (Potamon) Bouvieri Rathbun, 1904, p. 293, pl. 12, fig. 5.

Type locality. "Pools of Velantanguel, Southarkot", India. Also taken at Mauritius.

Potamon calcaratus Gordon

Potamon (Potamonautes) calcaratum Gordon, 1929, p. 405, text-figs. 1–5.

Type locality. Charre and Caia, Lower Zambezi Valley, Mozambique.

Potamon campi (Rathbun)

Parathelphusa campi Rathbun, 1894, p. 25.
Potamon (Parathelphusa) Campi Rathbun, 1905, p. 256, pl. 14, fig. 1.
Potamon (Parathelphusa) Campi Lenz, 1912, p. 7.
Potamonautes campi Balss, 1936, p. 186, text-fig. 22 (map).

Type locality. Stanley Pool, Belgian Congo.

Potamon capelloanus Rathbun

Telphusa Bayoniana var. a Capello, 1871, p. 131, pl. 2, fig. 10.
Potamon (Potamonautes) Capelloanus Rathbun, 1905, p. 179.

Capello's original specimens were found at Kakonda ("Caconda") and Huilla, Angola.

Potamon chaperi (A. Milne Edwards)

Parathelphusa Chaperi A. Milne Edwards, 1887, p. 144, pl. 8, fig. 4.
Potamon (Parathelphusa) Chaperi Rathbun, 1905, p. 262, pl. 14, fig. 6.

Type locality. Assini, Ivory Coast.

Potamon chavanesii (A. Milne Edwards)

Thelphusa Chavanesii A. Milne Edwards, 1886, p. 150.
Potamon (Parathelphusa) Chavanesii Rathbun, 1905, p. 232, pl. 13, fig. 1.
Potamon (Parathelphusa) chavanesii Sendler, 1912, p. 200.
Potamonautes chavanesii Balss, 1929a, p. 127.

Type locality. Franceville Lake, Gabon, French Congo.

Potamon congoënsis Rathbun

Potamon (Geothelphusa) congoënsis Rathbun, 1921, p. 422, text-fig. 11, pls. 28, fig. 3, and 29.
Potamon (Geotelphusa) congoensis Parisi, 1925, p. 97.
Geothelphusa congoensis Balss, 1936, p. 192, text-fig. 27 (map).

Type locality. Nepoko River, above Gamangui, Belgian Congo.

Potamon decazei (A. Milne Edwards)

Thelphusa Decazei A. Milne Edwards, 1886, p. 150.
Potamon (Potamonautes) Decazei Rathbun, 1904, pl. 16, fig. 3; 1905, p. 197.
Potamon (Potamonautes) decazei Sendler, 1912, p. 200.
Potamonautes Decazei Balss, 1914a, p. 103.
Potamonautes decazei Balss, 1914b, p. 405. (Part of these specimens were later referred by Balss (1929a) to *P. pobeguini*).
Potamonautes decazei Balss, 1929a, p. 118, pl., fig. 2.

Type locality. Franceville (Alima River), Gabon, French Congo.

Potamon depressus (Krauss)

Thelphusa depressa Krauss, 1843, p. 38, pl. 2, figs. 4–4c.
Potaman (Potamonautes) depressus Rathbun, 1905, p. 169.
Potamonautes depressus Stebbing, 1910, p. 294.
Potamon (Potamonautes) depressus Lenz, 1912, p. 7.
Potamonautes depressus Barnard, 1935, p. 484.

Type locality. Near Pietermaritzburg, Natal.

POTAMON DIDIERI Rathbun

Potamon (Potamonautes) Didieri Rathbun, 1904, pl. 14, fig. 9; 1905, p. 170.
Potamon (Potamonautes) didieri Sendler, 1912, p. 198.
Potamon (Potamonautes) Didieri Colosi, 1924, p. 5.
Potamonautes emini didieri Balss, 1929b, p. 246.
Potamon (Potamonautes) didieri Rathbun, 1935, p. 26.

Type locality. "Le Kibali (embouchure), 1015 mètres d'altitude; L. Didier, 1903, Mission du Bourg de Bozas." I have been unable to check this locality; it probably refers to an Ethiopian locality since I doubt that Didier collected in the Belgian Congo near the mouth of the Kibali River.

POTAMON DUBIUS (Capello)

Telphusa dubia Capello, 1873, p. 254, pl. 1, figs. 1–2.
Potamon (Potamonautes) dubius Rathbun, 1905, p. 179.
Potamon (Potamonautes) dubius Colosi, 1918, p. 106.
Potamon (Potomonautes) dubium Colosi, 1919, p. 51.
Potamon (Potamonautes) dubium Colosi, 1920, p. 32.
Potamonautes dubius Balss, 1922, p. 71.

Type locality. Kunene (Cunene) River, interior of Mossamedes, Angola.

POTAMON DYBOWSKII Rathbun

See page 187.

POTAMON ECORSSEI (Marchand)

Potamon (Potamonautes) Ecorssei Marchand, 1902, p. 334, pl. 13, figs. 2 and 6
Potamon (Potamonautes) Ecorssei Rathbun, 1905, p. 180.
Potamon (Potamonautes) ecorssei Roux, 1935a, p. 32.

Type locality. Lake Télé, west of Timbuktu, French Sudan.

POTAMON EDULIS (Latreille)

Potamophilus edulis Latreille, 1818, pl. 297, fig 4.
Potamon (Potamon) edulis Rathbun, 1904, p. 254, pl. 9, fig. 1.
Potamon (Potamon) edule var. *africanum* Colosi, 1920, p. 31.

Type locality. ?.

POTAMON EMINI (Hilgendorf)

See page 193.

Potamon faradjensis Rathbun

Potamon (Acanthothelphusa) faradjensis Rathbun, 1921, p. 428, text-fig. 13, pl. 31.
Potamonautes faradjensis Balss, 1929a, p. 126, text-fig. 8.
Potamonautes faradjensis Balss, 1936, p. 166, fig. 1 (map).

Type locality. Dungu River at Faradje, Belgian Congo.

Potamon floweri de Man

Potamon (Potamonautes) Floweri de Man, 1901, p. 94, pl. 10.
Potamon (Potamonautes) Floweri Rathbun, 1904, pl. 17, figs. 2 and 6; 1905, p. 193.
Potamon (Potamonautes) floweri Rathbun, 1921, p. 406, text-fig. 6, pl. 20, fig. 2.
Potamon (Potamonautes) Floweri Parisi, 1925, p. 99.
Potamonautes floweri Balss, 1929b, p. 347.
Potamon floweri Flower, 1931.
Potamonautes floweri Balss, 1936, p. 171, text-fig. 6 (map).

Type locality. Bahr el Gebel, Anglo-Egyptian Sudan.

Potamon goudoti (H. Milne Edwards)

Thelphusa Goudoti H. Milne Edwards, 1853, p. 212.
Potamon (Potamon) Goudoti Rathbun, 1904, p. 305, pl. 13, fig. 10.
Potamon Goudoti Lenz, 1910a, p. 557.
Potamon (Potamon) goudoti Calman, 1913, p. 920.
Potamon (Potamon) goudoti Balss, 1929b, p. 920.

Type locality. Madagascar.

Potamon grandidieri Rathbun

Potamon (Potamon) Grandidieri Rathbun, 1904, p. 298, pl. 12, fig. 11.

Type locality. Near "Bombetok", Madagascar.

Potamon granulata (Balss)

Potamonautes decazei granulata Balss, 1929a, p. 119.

The original specimens were taken at Misahöhe and Bismarckburg, Togo.

Potamon granviki Colosi

Potamon (Geothelphusa) Granviki Colosi, 1924, p. 16, text-fig. 11, pl. 1, fig. 5.

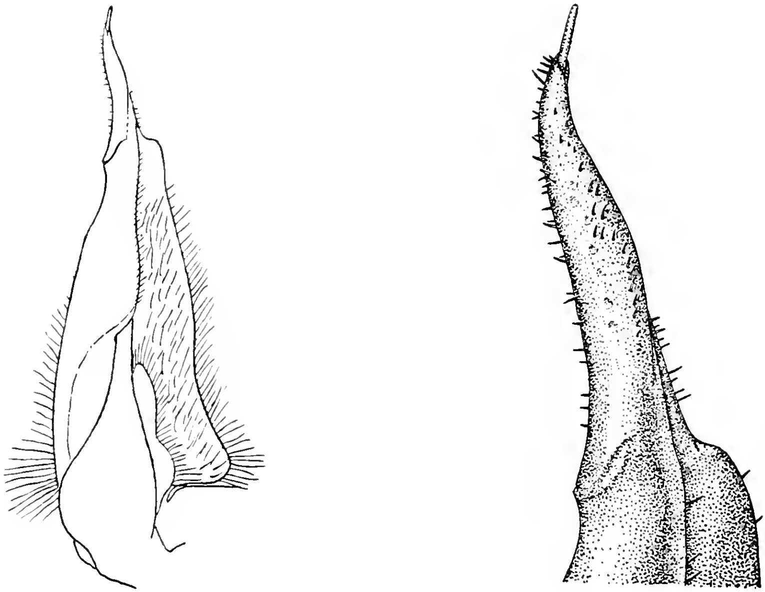
Type locality. Mount Elgon, Uganda (7,000 feet).

Balss (1929b) and Roux (1935) consider this species a synonym of *P. loveni*.

POTAMON HARVARDI Rathbun

Text-figure 9.

Potamon (*Geothelphusa*) *harvardi* Rathbun, 1935, p. 23, pl. 1.



A B

Fig. 9. *Potamon* (*Geothelphusa*) *harvardi*. A, posterior view of first and second right abdominal appendages of male holotype, x 6.9; B, posterior view of tips of same appendages, x 21.4.

Type locality. Sipi (6,500 feet), western part of Mount Elgon, Uganda.

Only in the holotype does the second abdominal appendage run up through the first; in all other males these two appendages are quite separate from one another.

POTAMON HILGENDORFI (Pfeffer)

See page 186.

Potamon humbloti Rathbun

Potamon (*Potamon*) *Humbloti* Rathbun, 1904, p. 297, pl. 12, fig. 10.

Type locality. Madagascar.

Potamon idjwiensis Chace

See page 197.

Potamon ignestii Parisi

Potamon (*Geotelphusa*) *Ignestii* Parisi, 1923, p. 332, text-fig. 1, pl. 8.
Potamon (*Geotelphusa*) *Ignestii* Parisi. 1925, p. 98.

Type locality. Gondar, from stream emptying into Lake Tana, Ethiopia.

Potamon inflatus (H. Milne Edwards)

Thelphusa inflata H. Milne Edwards, 1853, p. 210.
Potamon (*Potamonautes*) *inflatus* Rathbun, 1904, pl. 15, fig. 2; 1905, p. 174.
Potamon (*Potamonautes*) *inflatus* Cunnington, 1907, p. 259.
Potamonautes inflatus Stebbing, 1910, p. 294.
Potamonautes inflatus Barnard, 1935, p. 484.

Type locality. Durban (Port Natal), Natal.

Potamon infravallatus (Hilgendorf)

Telphusa infravallata Hilgendorf, 1898, p. 12, pl., figs. 2, 2a.
Potamon (*Potamonautes*) *infravallatus* Rathbun, 1905, p. 174.

Hilgendorf's specimens came from Buloa and Derema in the Usambara Mts., Tanganyika Territory.

Potamon jallae (Nobili)

Thelphusa dubia var. *Jallae* Nobili, 1896.
Potamon (*Potamonautes*) *dubius Jallae* Rathbun, 1904, pl. 15, fig. 6; 1905, p. 179.
Potamonautes dubius jallae, Balss, 1922, p. 72.
Potamon (*Potamonautes*) *dubium Jallae* Colosi, 1924, p. 4, text-fig. 2.
Potamonautes dubius var. *jallae* Barnard, 1935, p. 486, text-figs. 1 (k–l).
Potamonautes dubius jallae Balss, 1936, p. 177, text-figs. 14–16.

Type locality. Kazungula, Northern Rhodesia.

Potamon jeanneli Bouvier

Potamon (Geothelphusa) Jeanneli Bouvier, 1921, p. 51, text-figs. 5 and 6.
Potamon (Geothelphusa) Jeanneli Colosi, 1924, p. 15, text-fig. 10.

Type locality. Mount Kenya (2,700 meters), Kenya Colony.

Potamon johnstoni (Miers)

Thelphusa depressa var. *johnstoni* Miers, 1885, p. 237.
Potamon (Potamonautes) Johnstoni Rathbun, 1905, p. 170.
Potamon (Potamonautes) johnstoni Calman, 1909, p. 51, text-figs. 9–12. (The Ruwenzori specimens are *P. aloysii-sabaudiae*; see page 190.)
Potamon (Potamonautes) Johnstoni Sjöstedt, 1910, p. 1.
Potamon (Potamonautes) johnstoni Lönnberg and Budde-Lund, 1912, p. 1.
Potamon (Potamonautes) johnstoni ? Sendler, 1912, p. 198.
Potamon (Potamonautes) Johnstoni Colosi, 1920, p. 32. (These specimens should be referred to *P. aloysii-sabaudiae*; see page 190.)
Potamon (Potamonautes) Johnstoni Bouvier, 1921, p. 44.
Potamon (Potamonautes) Johnstoni Colosi, 1924, p. 21, text-fig. 15. (These specimens should be referred to *P. aloysii-sabaudiae*; see page 190.)
Potamonautes johnstoni Balss, 1929b, p. 343.
Potamonautes johnstoni Balss, 1936, p. 180, text-fig. 17.
Potamonautes johnstoni (f. typica) Pesta, 1937, p. 157.

Type locality. Mount Kilimanjaro, Tanganyika Territory.

Bouvier (1921) refers *P. ambiguus* to this species; Balss (1929b) concurs in this and adds *P. infravallatus* and *P. reichardi;* and the same author (1936) considers *P. usambarae* a synonym. See page 189 for remarks on the latter species. *P. aloysii-sabaudiae* is also considered synonymous by Colosi (1920 and 1924) and Balss (1929b) on the basis of Calman's discussion; this matter is discussed above on page 190. It is difficult to determine whether the specimens identified as *P. johnstoni* by Lönnberg and Budde-Lund and by Sendler really belong to this species, but I believe that the other references (with the possible exception of some of the specimens listed by Balss (1929b)) are correct unless otherwise noted.

Potamon laetabilis de Man

Potamon (Geothelphusa) Neumanni var. *laetabilis* de Man, 1914, p. 122, pl. 2, figs. 1–1b.
Potamonautes emini laetabilis Balss, 1929b, p. 346.

Type locality. Let Marefia, Choa ("Schoa"), Ethiopia.

Potamon langi Rathbun

Potamon (Acanthothelphusa) langi Rathbun, 1921, p. 430, text-fig. 14, pl. 32.
Potamonautes langi Balss, 1936, p. 189, text-fig. 25 (map).

Type locality. Congo River at Stanleyville, Belgian Congo.

Potamon latidactylus de Man

Telphusa africana de Man, 1881, p. 121. Not *Thelphusa africana* A. Milne Edwards, 1869.
Potamon (Potamonautes) latidactylum de Man, 1903, p. 41, pl. 9. figs. 1–6.
Potamon (Potamonautes) latidactylus Rathbun, 1904, pl. 16, fig. 7; 1905, p. 190.
Potamonautes latidactylus Balss, 1914b, p. 405.
Potamon (Potamonautes) latidactylum Colosi, 1924, p. 12, text-fig. 8.
Potamon (Potamonautes) latidactylus Roux, 1935a, p. 31.

Type locality. Prah River, Ashanti, Gold Coast.

Potamon lindblomi Colosi

Potamon (Potamonautes) Lindblomi Colosi, 1924, p. 5, text-fig. 3, pl. 1, fig. 2.

Type locality. Machako's, southeast of Nairobi, Kenya Colony.

Potamon lirrangensis Rathbun

See page 188.

Potamon longimerus Roux

Potamon (Geotelphusa) Loveni longimerus Roux, 1935, p. 244, text-figs. 1–3.

Type locality. Mount Elgon (3,900 to 4,000 meters), Kenya Colony.

Potamon lovéni Colosi

Potamon (Geothelphusa) Lovéni Colosi, 1924, p. 13, text-fig. 9, p. 1, fig. 4.
Geotelphusa loveni Balss, 1929b, p. 351.
Potamon (Geotelphusa) Loveni Roux, 1935, p. 243.

Type locality. Mount Elgon, Uganda.

P. granviki is a synonym of this species according to Balss (1929b) and Roux (1935).

Potamon loveridgei Rathbun

Potamon (Potamonautes) loveridgei Rathbun, 1933, p. 251, pl. 1, pl. 2, fig. 1.

Type locality. Luiche River, Ujiji, Tanganyika Territory.

P. stappersi is a synonym of this species.

Potamon lueboensis Rathbun

Potamon (Potamonautes) lueboensis Rathbun, 1904, pl. 14, fig. 2; 1905, p. 166.
Potamonautes lueboensis Balss, 1936, p. 172, text-figs. 7 and 8.

Type locality. Luebo, Belgian Congo.

Colosi (1924) includes this species in the synonymy of *P. perlatum*. Balss (1929a) considered it a synonym of *P. anchietae* but later (1936) decided that it was distinct.

Potamon macropus Rathbun

See *Cylindrotelphusa macropus* (p. 226).

Potamon madagascariensis (A. Milne Edwards)

Thelphusa madagascariensis A. Milne Edwards, 1872, p. 1.
Potamon (Potamon) madagascariensis Rathbun, 1904, p. 264, pl. 9, fig. 7.
Patamon madagascarensis Lenz, 1910a, p. 557.
Potamon (Potamon) madagascariense Calman, 1913, p. 916.
Potamon (Potamon) madagascariensis Balss, 1929b, p. 354.

Type locality. On route between "Bombetok" and Antananarivo (Tananarive), Madagascar.

P. pittarellii was considered a synonym of this species by Balss (1929b), but later (1934) he decided the two were distinct.

Potamon marchei Rathbun

Potamon (Parathelphusa) Marchei Rathbun, 1902, p. 187.
Potamon (Parathelphusa) Marchei Rathbun, 1905, p. 264, text-fig. 70, pl. 14, fig. 4.

Type locality. Samkita, Ogowe River, Gabon, French Congo.

Potamon margaritarius (A. Milne Edwards)

Thelphusa maragaritaria A. Milne Edwards, 1869, p. 185, pl. 9, figs. 4–4b.
Potamon (Potamonautes) margaritarius Rathbun, 1904, pl. 14, fig. 10; 1905, p. 168, text-fig. 41.
Thelphusa margaritaria Osorio, 1905, p. 149.
Potamonautes margaritarius Balss, 1914a, p. 102.
Potamon (Potamonautes) margaritarius de Man, 1914, p. 135.

Type locality. St. Thomas Island, west of Gabon, French Congo.

Potamon methueni Calman

Potamon (Potamon) methueni Calman, 1913, p. 920, pl. 91.

Type locality. "Imerimandrosa", Madagascar.

This species is a synonym of *P. ankaraharae* according to Colosi (1920) and Balss (1929b).

Potamon monodi (Balss)

Potamonautes aubryi monodi Balss, 1929a, p. 123, text-fig. 4.

The original specimens were taken at the following localities in Gabon, French Congo: Garua, between Tschamba and Laro, Satsche, Benue and Moba.

Potamon mrogoroensis (Hilgendorf)

Telphusa mrogoroensis Hilgendorf, 1898, p. 10.
Potamon (Potamonautes) mrogoroensis Rathbun, 1905, p. 173.

Type locality. Morogoro, Tanganyika Territory.

This species is a synonym of *P. hilgendorfi* according to Balss (1929b).

Potamon mutandensis Chace

See page 194.

Potamon neumanni (Hilgendorf)

Telphusa neumanni Hilgendorf, 1898, p. 18, pl., fig. 6.
Potamon (Geothelphusa) Neumanni Rathbun, 1905, p. 210.
Potamon (Geothelphusa) Neumanni de Man, 1914, p. 122, pl. 2, figs. 2–2b.
Potamon (Geothelphusa) Neumanni Colosi, 1920, p. 34.
Potamon (Geothelphusa) Neumanni Colosi, 1924, p. 18, text-fig. 13, pl. 1, fig. 7.
Geotelphusa neumanni Balss, 1929b, p. 350.
Potamon (Geotelphusa) Neumanni Roux, 1935, p. 246.

Type locality. Ngare Rongai ("Ngare Longai"), Kenya Colony.

P. alluaudi is a synonym of this species according to Balss (1929b).

Potamon nigrensis Rathbun

Potamon (Potamon) nigrensis Rathbun, 1904, p. 295, pl. 12, fig. 8.
Potamonautes nigrensis Balss, 1936, p. 200.

Type locality. Niger River between Timbuktu and Say, French Sudan.

Potamon niloticus (H. Milne Edwards)

Thelpheusa nilotica H. Milne Edwards, 1837, p. 12.
Potamon (Parathelphusa) niloticus Rathbun, 1905, p. 263, pl. 14, fig. 15.
Parathelphusa nilotica Nobili, 1906b, p. 1.
Parathelphusa nilotica Nobili, 1909, p. 357.
Potamon (Parathelphusa) niloticus Lenz, 1912, p. 3.
Potamon (Acanthotelphusa) niloticum Colosi, 1919, p. 52.
Potamon (Acanthothelphusa) niloticum Colosi, 1920, p. 27.
Potamon (Potamonautes) niloticum Colosi, 1924, p. 12, text-fig. 7.
Potamonautes niloticus Balss, 1929b, p. 348.
Potamon nilotica Flower, 1931, p. 733.
Potamon (Acanthothelphusa) niloticus Rathbun, 1933, p. 258.
Potamon (Acanthothelphusa) niloticus Rathbun, 1935, p. 25.

Type locality. Nile River.

Potamon obesus (A. Milne Edwards)

See page 190.

Potamon odhneri Colosi

Potamon (Potamonautes) perlatum Colosi, 1920, p. 33.
Potamon (Potamonautes) Odhneri Colosi, 1924, p. 7, text-fig. 4, pl. 1, fig. 3.

Type locality. Limuru, Kenya Colony.

Potamon orbitospinus Cunnington

Potamon (Potamonautes) orbitospinus Cunnington, 1907, p. 259, pl. 16, fig. 1.
Potamonautes orbitospinus Balss, 1929b, p. 349.
Potamonautes orbitospinus Balss, 1936, p. 182, text-fig. 18.

Cunnington's specimens were taken along the western shore of Lake Nyasa.

Potamon paecilei (A. Milne Edwards)

Thelphusa Paecilei A. Milne Edwards, 1886, p. 149.
Potamon (Parathelphusa) Paecilei Rathbun, 1904, pl. 17, fig. 5; 1905, p. 257, text-fig. 67.

Type locality. Alima River, Ubangi-Shari Province, French Congo.

Potamon pelii (Herklots)

Thelphusa Pelii Herklots, 1861, p. 13.
Potamon (Potamonautes) Pelii Rathbun, 1905, p. 193.
Potamon (Potamonautes) pelii Sendler, 1912, p. 198.

Type locality. Elmina ("St. George del Mina"), Gold Coast.

Potamon perlatus (H. Milne Edwards)

Thelpheusa perlata H. Milne Edwards, 1837, p. 13.
Potamon (Potamonautes) perlatus Rathbun, 1904, pl. 14, fig. 4; 1905, p. 163.
Potamon (Potamonautes) perlatum Doflein, 1904, p. 105.
Thelphusa perlata Osorio, 1905, p. 149.
Potamonautes perlatus Stebbing, 1905, p. 33.
Thelphusa perlata Stimpson, 1907, p. 113.
Potamonautes perlatus Stebbing, 1910, p. 293.
Potamon (Potamonautes) perlatus Lenz, 1910a, p. 558.
Potamon (Potamonautes) perlatus Lenz, 1910b. p. 124.
Potamon (Potamonautes) perlatum Colosi, 1920, p. 33. (These specimens were later (1924) made the types of *P. odhneri* by Colosi).
Potamonautes perlatus Balss, 1922, p. 71.
Potamon (Potamonautes) perlatum Colosi, 1924, p. 2, text-fig. 1.
Potamonautes perlatus Barnard, 1935, p. 482, text-figs. 1a–1b.
Potamonautes perlatus Balss, 1936, p. 184, text-figs. 20 and 21.

Type locality. Cape of Good Hope.

Colosi (1924) included *P. anchietae*, *P. lueboensis*, *P. regnieri*, *P. reichardi* and *P. sidneyi* among the synonyms of this species. *P. anchietae* had previously been synonymized by Doflein (1904) and Colosi (1920). Balss (1929a) followed Colosi in synonymizing *P. lueboensis* but later (1936) considered the latter a distinct species.

Potamon perparvus Rathbun

Potamon (Geothelphusa) perparvus Rathbun, 1921, p. 425, text-fig. 12, pls. 28, fig. 2, and 30.
Potamon (Geothelphusa) perparvus Rathbun, 1935, p. 24.

Type locality. Stanleyville, Belgian Congo.

Potamon perrieri Rathbun

See *Cylindrotelphusa perrieri* (page 226).

Potamon pilosus (Hilgendorf)

Telphusa pilosa Hilgendorf, 1898, p. 19.
Potamon (Geothelphusa) pilosus Rathbun, 1905, p. 210.
Potamonautes emini var. *pilosus* Balss. 1929b, p. 347.

Type locality. Rain forest near Marangu (at base of Mt. Kilimanjaro), Tanganyika Territory.

POTAMON PITTARELLII Nobili

Potamon (Potamon) Pittarellii, Nobili, 1905, p. 1, text-fig.
Parathelphusa (Oziothelphusa) Pittarellii Colosi, 1920, p. 25.
Potamon pittarellii Balss, 1934, p. 520, pl. 1, fig. 1.

Type locality. Moramanga, Madagascar.

Balss (1929b) considered this a synonym of *P. madagascariensis* but later (1934) retained it as a distinct species

POTAMON PLATYCENTRON (Hilgendorf)

Telphusa platycentron Hilgendorf, 1897, p. 81.
Potamon (Potamonautes) platycentron Rathbun, 1905, p. 173.
Potamonautes platycentron Balss, 1929b, p. 349.

Type locality. Lake Chala ("Tschala"), Kenya Colony.

POTAMON PLATYNOTUS Cunnington

Potamon (Potamonautes) platynotus Cunnington, 1907, p. 264, pl. 17, figs. 1 and 3.
Potamonautes platynotus Balss, 1929b, p. 349.
Potamonautes platynotus Balss, 1936, p. 185.

The original specimens came from Lake Tanganyika.

POTAMON POBEGUINI Rathbun

Potamon (Potamonautes) Pobeguini Rathbun, 1904, pl. 16, fig. 8; 1905, p. 195.
Potamonautes pobequini Stebbing, 1910, p. 295.
Potamonautes pobeguini Balss, 1929a, p. 120, text-fig. 1, pl., fig. 1.

Type locality. Bata (Batah), Gabon, French Congo.

POTAMON POTAMIOS (Olivier)

Cancer potamios Olivier, 1804, p. 240, pl. 30, fig. 2.
Potamon (Potamon) potamios Rathbun, 1904, p. 257, text-fig. 2, pl. 9, fig. 5.

Type locality. ?

POTAMON PSEUDOPERLATUS (Hilgendorf)

Telphusa suprasulcata var. *pseudoperlata* Hilgendorf, 1898, p. 9.
Potamon (Potamonautes) suprasulcatus pseudoperlatus Rathbun, 1905, p. 173.

Type locality. Usambara region, Tanganyika Territory.

POTAMON REGNIERI Rathbun

Potamon (Potamonautes) Regnieri Rathbun, 1904, pl. 14, fig. 3; 1905, p. 168, text-fig. 40.

Type locality. Sanga River, French Congo.

This species was referred to *P. perlatus* by Colosi (1924) and to *P. anchietae* by Balss (1929a).

POTAMON REICHARDI (Hilgendorf)

Telphusa Reichardi Hilgendorf, 1898, p. 13.
Potamon (Potamonautes) Reichardi Rathbun, 1905, p. 166.
Potamonautes reichardi Balss, 1914b, p. 404.
Potamon (Potamonautes) reichardi Rathbun, 1933, p. 254, pl. 3, pl. 4, figs 3 and 4.

Type locality. South of Tabora (?), Tanganyika Territory.

Colosi (1924) synonymized this species with *P. perlatum* and Balss (1929b) referred it to *P. johnstoni*.

POTAMON RODOLPHIANUS Rathbun

Potomon (Potamonautes) rodolphianus Rathbun, 1909, p. 102.
Potamon (Potamonautes) rodolphianus Rathbun, 1922, p. 35, text-fig. 1, pl. C^3, figs. 1–3.

Type locality. South of Lake Rudolf, Kenya Colony.

POTAMON ROTHSCHILDI Rathbun

Potamon (Potamonautes) Rothschildi Rathbun, 1909, p. 103.
Potamon (Potamonautes) Rothschildi Rathbun, 1922, p. 37, text-fig. 2, pl. C^3, figs. 4–9.

Type locality. Kenya Colony.

POTAMON SCHUBOTZI (Balss)

Geotelphusa schubotzi Balss, 1914a, p. 103, figs. 7–12.

Type locality. Duma, Belgian Congo.

Potamon sidneyi Rathbun

Potamon (Potamonautes) Sidneyi Rathbun, 1904, pl. 14, fig. 5; 1905, p. 165, text-fig. 38.
Potamonautes sidneyi Stebbing, 1910, p. 295.
Potamon (Potamonautes) Sidneyi Lenz, 1912, p. 7.
Potamonautes sidneyi Balss, 1922, p. 71
Potamonautes perlatus (sidneyi form) Barnard, 1935, p. 483, text-fig. 1c.

Type locality. Natal.
Colosi (1924) refers this species to *P. perlatus.*

Potamon socotrensis (Hilgendorf)

Telphusa socotrensis Hilgendorf, 1883, p. 171.
Potamon (Geothelphusa) Socotrensis Rathbun, 1905, p. 212.
Potamon socotrense Balss, 1929b, p. 342.

Type locality. Kerignigi, Socotra Island.

Potamon stanleyensis Rathbun
Text-figure 10

Potamon (Potamonautes) stanleyensis Rathbun, 1921, p. 415, text-fig. 9, pl. 26, figs. 1–2.

Type locality. Affluents of the Chopo (Tshopo) River at Stanleyville, Belgian Congo.
Balss (1936) considers this species synonymous with *P. dybowskii;* for a discussion of this, see remarks above under the latter species (page 187).

Potamon stappersi (Balss)

Potamonautes johnstoni stappersi Balss, 1936, p. 182, text-figs, 19 and 20.

The original specimens were taken near Lake Tanganyika.
As Balss suggested, this species should be synonymized with *P. loveridgei;* comparison of the first male abdominal appendage of that species with Balss' figures proves the two species to be identical.

Potamon suprasulcatus (Hilgendorf)

See *P. hilgendorfi* (page 186).

Potamon unisulcatus Rathbun

Potamon (Potamonautes) johnstoni unisulcatus Rathbun, 1933, p. 255, pl. 2, figs. 1, 2 and 4.

Type locality. Bagilo, Uluguru Mountains, Tanganyika Territory.

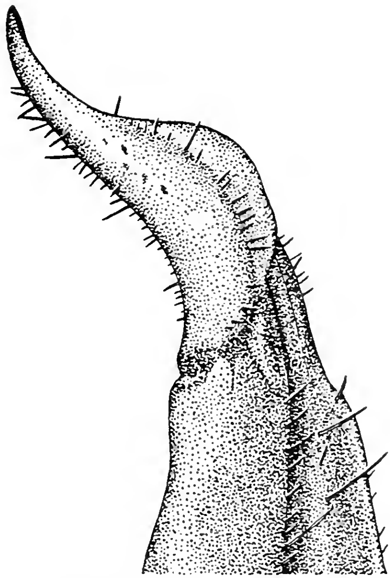


Fig. 10. *Potamon (Potamonautes) stanleyensis;* posterior view of end of first right abdominal appendage of male paratype (carapace breadth 342. mm.) from Stanleyville, Belgian Congo, x 25.

Potamon usambarae Rathbun

See page 189.

Potamon vandenbrandeni (Balss)

Potamonautes vandenbrandeni Balss, 1936, p. 190, text-fig. 26.

Type locality. Leopoldville, Belgian Congo.

Potamon walderi Colosi

Potamon (Potamonautes) Walderi Colosi, 1924, p. 8, text-fig. 5.
Potamonautes Walderi Balss, 1936, p. 167, text-figs. 2 and 3.

Type locality. "Kingoyi", Lower French Congo.

Potamon warreni Calman

Potamon (*Potamonautes*) *warreni* Calman, 1918, p. 234.
Potamon (*Potamonautes*) *Warreni* Colosi, 1924, p. 9, text-fig. 6, pl. 1, figs. 1–1a.
Potamonautes warreni Barnard, 1935, pp. 483–484, text-figs. 1d–1j.

Type locality. Potchefstroom, Transvaal.

Potamon, sp. ? Cunnington

Potamon (*Potamonautes*) sp. ? Cunnington, 1907, p. 262.

Kondowe to Karonga, Nyasaland.

Potamon, sp. ? Cunnington

Potamon (*Potamonautes*) sp. ? Cunnington, 1907, p. 266.

Lake Tanganyika.

HYDROTHELPHUSA

Hydrothelphusa agilis (A. Milne Edwards)

Hydrothelphusa agilis A. Milne Edwards, 1872, p. 2.
Hydrothelphusa agilis Rathbun, 1905, p. 266, text-fig. 72, pl. 17, fig. 7.
Hydrothelphusa agilis Nobili, 1906b, p. 1.
Hydrothelphusa agilis Calman, 1913, p. 922.
Hydrothelphusa agilis Colosi, 1920, p. 21.
Hydrotelphusa agilis Balss, 1929b, p. 357.

Type locality. Sakaleone River, Madagascar.

PLATYTHELPHUSA

Platythelphusa armata A. Milne Edwards

Platythelphusa armata A. Milne Edwards, 1887, p. 147, pl. 9.
Platythelphusa armata Rathbun, 1905, p. 269, pl. 21, fig. 4.
Platythelphusa armata Cunnington, 1907, p. 268, text-fig. 84.
Platytelphusa armata Balss, 1929b, p. 352.
Platythelphusa armata Balss, 1936, p. 196.

Type locality. Lake Tanganyika.

Platythelphusa conculcata Cunnington

Platythelphusa conculcata Cunnington, 1907, p. 273, pl. 17, figs. 2 and 4.
Platythelphusa conculcata Balss, 1936, p. 196, text-fig. 29.

Type locality. South end of Lake Tanganyika (10–15 fathoms).

Platythelphusa maculata (Cunnington)

Limnothelphusa maculata Cunnington, 1899, p. 698, pl. 38.
Limnothelphusa maculata Rathbun, 1905, p. 269.
Platythelphusa maculata Cunnington, 1907, p. 271, pls. 5–6.
Platythelphusa maculata Balss, 1936, p. 196.

Type locality. Kituta Bay, Lake Tanganyika.

ERIMETOPUS

Erimetopus brazzae (A. Milne Edwards)

Telphusa Brazzae A. Milne Edwards, 1886, p. 148.
Erimetopus Brazzae Rathbun, 1905, p. 270, text-fig. 73, pl. 21, fig. 8.
Erimetopus Brazzae Lenz, 1912, p. 9.
Erimetopus Brazzae Colosi, 1920, p. 27.
Erimetopus brazzae Rathbun, 1921, p. 433, text-fig. 15, pl. 33.
Erimetopus brazzae Balss, 1936, p. 195.

Type locality. Nganchu (Ngancin), Belgian Congo.

DECKENIINAE

DECKENIA

Deckenia alluaudi A. Milne Edwards and Bouvier

Deckenia Alluaudi A. Milne Edwards and Bouvier, 1893, p. 325, pl. 8.
Deckenia Alluaudi Rathbun, 1905, pl. 21, fig. 5; 1906, p. 72, text-fig. 124.
Deckenia alluaudi Borradaile, 1907, p. 63.

Type locality. Praslin Island, Seychelle Islands.

Deckenia imitatrix (Hilgendorf)

Deckenia imitatrix Hilgendorf, 1869a, p. 2.
Deckenia imitatrix Rathbun, 1905, pl. 21, fig. 6; 1906, p. 69.
Deckenia imitatrix Colosi, 1918, p. 107.
Deckenia imitatrix Colosi, 1919, p. 53.
Deckenia imitatrix Colosi, 1925, p. 3.
Deckenia imitatrix Parisi. 1925, p. 99.
Deckenia imitatrix Balss, 1929b, p. 353.

Type locality. "Kudiano", Kenya Colony.

Deckenia mitis (Hilgendorf)

See page 201.

GECARCINUCINAE

CYLINDROTELPHUSA

Cylindrotelphusa macropus (Rathbun)

Potamon (Geothelphusa) macropus Rathbun, 1898, p. 29, pl. 2, figs. 1–4.
Potamon (Geothelphusa) macropus Rathbun, 1904, pl. 18, fig. 1; 1905, p. 221.
Geotelphusa macropus Balss, 1914b. p. 406.
Cylindrotelphusa macropus Rathbun, 1921, p. 385.
Potamon (Geothelphusa) macropus Balss, 1936, p. 200.

Type locality. Mouth of the Mesurado River, Monrovia, Liberia.

Cylindrotelphusa perrieri (Rathbun)

Potamon (Geothelphusa) Perrieri Rathbun, 1904, pl. 18, fig. 11; 1905, p. 222, text-fig. 53.
Cylindrotelphusa perrieri Rathbun, 1921, pp. 385 and 386.

Type locality. "Congo".

PARATHELPHUSA

Parathelphusa afzelii Colosi

Parathelphusa (Barythelphusa) Afzelii Colosi, 1924, p. 19, text-fig. 14, pl. 1, fig. 8.

Type locality. Sierra Leone. Balss (1936, p. 200) doubts that this locality is correct.

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SCIENTIFIC RESULTS OF A FOURTH EXPEDITION TO FORESTED AREAS IN EAST & CENTRAL AFRICA

IV

REPTILES

By Arthur Loveridge

With Six Plates

CAMBRIDGE, MASS., U.S.A.
PRINTED FOR THE MUSEUM
December, 1942

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OF THE

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No. 4. — *Scientific Results of a Fourth Expedition to Forested Areas in East and Central Africa*

IV

Reptiles

By Arthur Loveridge

CONTENTS

INTRODUCTION

The collection on which the following report is based, was made by the author while investigating the fauna of certain forested regions of East and Central Africa. The enquiry was carried out on behalf of the Museum of Comparative Zoölogy with a fellowship granted by the John Simon Guggenheim Memorial Foundation of New York.

A synopsis of the itinerary is given in the caption accompanying Plate 1—a map showing the position of the principal collecting localities. Altitudes and detailed information regarding the various camps will be furnished in the final report of this series which will deal with the general conclusions arrived at.

The period of collecting reptiles was from October 27, 1938, to July 25, 1939, during which time 1,862 reptiles, representing 144 species, were secured. This total, which does not include seven additional species received as a gift, comprises 1 species of crocodile, 6 of tortoises, 74 (+ 7 donated) of snakes, and 61 of lizards, including chameleons. In all 17 of these were new to the collection of the Museum of Comparative Zoölogy exclusive of 7 other races not previously recognized, but now considered valid as a result of this study of additional material.

Seven forms are here described as new, some (in parentheses) are based on material from earlier collections. The new forms are:

Typhlops tettensis rondoensis,	Nchingidi, Rondo Plateau, T. T.
Hemidactylus tropidolepis barbouri,	Changamwe, near Mombasa, K. C.
[1]*Amphisbaena rondoensis,*	Nchingidi, Rondo Plateau, T. T.
Melanoseps ater rondoensis,	Nchingidi, Rondo Plateau, T. T.
(*Melanoseps ater matengoensis,*	Ugano, Matengo Highlands, T. T.)
(*Melanoseps ater uzungwensis,*	Kigogo, Uzungwe Mountains, T. T.)
Chamaeleo dilepis idjwiensis,	Idjwi Island, Lake Kivu, B. C.

In addition to these new forms, the undermentioned races or species are recorded for the first time for certain countries.

New for Kenya Colony

Lycophidion capense ornatum Parker

New for Uganda

Dipsadoboa unicolor Günther
Miodon gabonensis collaris (Peters)
Brookesia spectrum boulengeri (Steindachner)

New for Tanganyika Territory

Lycophidion capense ornatum Parker
Lygosoma tetradactylus hemptinnei (Witte)

New for Belgian Congo

Typhlops blanfordii lestradei Witte
Miodon gabonensis graueri Sternfeld

Several species, heretofore regarded as rarities, might be singled out for special mention, among them: *Cycloderma frenatum, Rhamnophis a. elgonensis, Miodon g. graueri, Amphisbaena phylofiniens, A. orientalis, A. ewerbecki, Algiroides vauereselli, A. africanus, Lygosoma g. graueri, L. meleagris, L. blochmanni,* and *Chamaeleo xenorhinus.*

[1] The description of this species recently (1941) appeared in connection with a revision of the Amphisbaenidae (Bull. Mus. Comp. Zoöl., **87**, p. 394, fig. 23).

ACKNOWLEDGMENTS

The opportunity is taken of thanking Dr. Thomas Barbour, Director of the Museum of Comparative Zoölogy, for his ever ready encouragement in furthering the prosecution of this work, and to the John Simon Guggenheim Memorial Foundation without whose generous aid this expedition would not have been possible.

Lt. Col. C. R. S. Pitman of the Game Department, not only welcomed us to Uganda and smoothed our path by many helpful deeds, but donated sundry snakes. His name follows in parenthesis after the locality of such of them as are included in this report.

In appreciation of the action of His Excellency the Governor of the Congo Belge in granting permission to collect on Idjwi Island, a selection of duplicates of such species as were collected in Belgian territory are being set aside for dispatch to the Congo Museum, Tervueren, after the German evacuation of Belgium.

Messrs C. M. Bogert (American Museum) and V. FitzSimons (Transvaal Museum) have patiently answered all manner of questions which entailed lengthy examination of much material in the herpetological collections of which they are in charge.

A number of my colleagues have aided by identification of parasites or prey in their particular field. Among those to whom I am indebted are: Dr. J. C. Bequaert (ticks), Dr. Fenner A. Chace Jr. (crabs), Dr. J. P. Chapin (nestlings), Dr. P. J. Darlington Jr. and Floyd G. Werner (insects in certain stomach contents), Dr. H. R. Hill (linguatulids), and Drs. B. Schwarz and J. T. Lucker (nematodes and trematodes), of the United States Department of Agriculture.

The photographs illustrating this report were taken by my son, Brian A. Loveridge, and for permission to use the blocks of plates 2–6 we are indebted to the Editor of the Scientific Monthly, in which journal (June and July, 1940) they appeared as illustrations to a popular account of the safari.

SUMMARY OF TAXONOMIC ALTERATIONS

The undermentioned change in generic status is made:

Lacerta vaueresel li Tornier becomes *Algiroides vaueresel li* (Tornier)

The following forms are accorded subspecific rank:

Dipsas medici Bianconi revived as *Dasypeltis scaber medici* (Bianconi)

Dasypeltis fasciatus A. Smith revived as *Dasypeltis scaber fasciatus* A. Smith

Coluber palmarum Leach revived as *Dasypeltis scaber palmarum* (Leach)

Mabuia boulengeri Sternfeld revived as *Mabuya maculilabris boulengeri* Sternfeld

Melanoseps ater longicauda Tornier revived

Typhlops obtusus Peters becomes *Typhlops tettensis obtusus* Peters

Calamelaps feae Boulenger becomes *Calamelaps unicolor feae* Boulenger

Calamelaps warreni Boulenger becomes *Calamelaps unicolor warreni* Boulenger

Aparallactus uluguruensis B. & L. becomes *Aparallactus capensis uluguruensis* Barbour & Loveridge

Sepsina hemptinnei Witte becomes *Scelotes tetradactylus hemptinnei* (Witte)

Rhampholeon boulengeri Steindachner becomes *Brookesia spectrum boulengeri* (Steindachner)

The undermentioned are considered to be synonyms:

Kinixys spekii Gray	=*Kinixys belliana belliana* Gray
Thrasops j. mossambicus Mertens	=*Dispholidus typus* (A. Smith)
Dasypeltis macrops Boulenger	=*D. scaber fasciatus* A. Smith
Calamelaps mellandi Boulenger	=*C. unicolor warreni* Boulenger
Calamelaps pellegrini Angel	=*Rhinocalamus ventrimaculatus* Roux
Aparallactus ubangensis Boulenger	=*Aparallactus modestus* (Günther)
Aparallactus dolloi Werner	= "
Aparallactus congicus Werner	= "
Aparallactus batesii Boulenger	= "
Aparallactus nigrocollaris Chabanaud	= "
Aparallactus n. roucheti Chabanaud	= "
Aparallactus graueri Werner	= "
Atractaspis schoutedeni Witte	=*Atractaspis irregularis* (Reinhardt)
Atractaspis katangae Boulenger	=*Atractaspis bibronii* (A. Smith)
Hemidactylus tasmani Hewitt	=*H. mabouia* (Moreau de Jonnés)
H. persimilis Barbour & Loveridge	=*H. gardineri* Boulenger
Hemidactylus mandanus Loveridge	=*H. gardineri* Boulenger
Algiroides boulengeri Peracca	=*A. vaueresel li* (Tornier)
Lygosoma gromieri Angel	=*Lygosoma kilimense* Stejneger
?*L. (Siaphos) compressicauda* Witte	= "
?*Siaphos dewittei* Loveridge nom. nov.	= "
Lygosoma (Siaphos) burgeoni Witte	=*Lygosoma meleagris* Boulenger

It might be added that the extensive synonymizing of *Aparallactus* results from revisionary studies of that and allied genera now in M S.

LIST OF SPECIES COLLECTED*

* The seven species marked by an asterisk (*) were not collected, but were presented to the Expedition by Lt. Col. C. R. S. Pitman. The three species in brackets are discussed, though not collected.

CROCODYLIDAE

Crocodylus niloticus Laurenti

Crocodylus niloticus Laurenti (part), 1768, Syn. Rept., p. 53: "India orientali, et Aegypto."

Juv. alc. (M. C. Z. 48000) Mbanja, nr. Lindi, T. T. 3.v.39.

Distribution. Crocodiles were plentiful at Kitaya on the Ruvuma River and frequently seen basking on the banks of the Mkulumusi River, opposite the Siga Caves, near Tanga.

Native names. Ngwena (Kiyao, and Kimakonde at Mbanja); *mbulu* (Kimakonde at Mikindani).

Measurements. A stocky ♀ from Kitaya measured 8 feet from snout to anus, but possessed only the stump of a tail 3 feet in length, the injury had healed long ago. The estimated weight would be between 250 and 300 pounds.

Breeding. Some of her ova, on April 1, were enlarged to an inch in diameter, but still spherical.

Diet. Her stomach was empty except for a couple of pounds weight of pebbles and gravel. That of the Mbanja crocodile was full of marine crabs (*Sesarma meinerti*) from the nearby estuary.

Defence. An Mbanja man, going after dark to bathe in a small pool near his house, was greeted by a loud hissing noise. Returning home for a pole, he killed the young crocodile which had sought to scare him.

Migration. A Kitaya man, at daybreak was passing along a native footpath through a maize plantation when he heard a grunting noise. Thinking of pigs, he crept to the spot and peering through the stems of maize, saw an eleven-foot crocodile. After obtaining a heavy pole, he smashed in the skull so effectively that he rendered the reptile useless as a specimen.

Folklore. On learning that I had no use for the carcass, one of my Baganda skinners asked to be allowed to excise the musk glands and tip of the injured tail. These, said he, if hung on a game net, would insure that wild pigs and blue duiker became ensnared during a drive, a form of hunting on which he was something of an authority.

At Mbanja, the chief and his brother requested me most earnestly to see that the viscera of the young crocodile was buried, and on no account to allow anyone to have it, "for", said they, "the bile is intensely poisonous and some years ago, when put into a well here, caused the death of several people."

TESTUDINIDAE

Kinixys belliana belliana Gray

Kinixys Belliana Gray, 1831, Syn. Rept., p. 69: No locality.
Kinixys Spekii Gray, 1862, Ann. Mag. Nat. Hist. (3), **12**, p. 381: Central Africa.

1 ♂ 3 ♀ (M. C. Z. 48001–4) Ujiji, T. T. 11.iii.39.
♂ (M. C. Z. 48005) Kitaya, T. T. 27.iii.39.
2 ♂ 2 ♀ (M. C. Z. 48006–9) Mikindani, T. T. 21–24.iv.39.
♀ (M. C. Z. 48010) Amboni Estate, T. T. 19.vi.39.

Distribution. Seen also at Nchingidi, Rondo Plateau; and near Lake Rutamba.

Native names. *Ngongo* (Kiyao); *nambi* (Kimakonde and Kimawiha).

Variation. After further careful study of *all* the Tanganyika and Kenya material of this genus in the Museum, I am forced to the conclusion that they represent but one highly variable species possessing no stable characters on which races can be separated. Apparently the high vaulted type, which I previously thought was characteristic of the savanna, is the result of vertical growth continuing after longitudinal growth has slowed down. Females are somewhat broader than males but the whole Mikindani series are distinctly broader than any other East African specimens.

Height of carapace is included in its length from 2.0 to 2.5 times, though the total lengths are from 127 to 191 mm., *i.e.* semiadult or adult; width of nuchal is included in the width of its adjacent marginal from 3 (M. C. Z 48004) to 18 (M. C. Z. 48008–9) times in the whole series, or from to 4 to 18 times in the Mikindani series alone! Vertebrals 5, except for M. C. Z. 48001 which has 6; marginals 22, except for M. C. Z. 48001 which has 24.

Sexual dimorphism. Boulenger (1889a, p. 144) thought that the length of the thickened anterior lip of the plastron equaled about a quarter of the plastral length in males, a fifth in females. There is an average difference but the area of overlap is too great to make the character of value, thus, length of gulars into plastral length in 9 East African males ranges from 6 to 7½ times, average 6.5, in 12 females it ranges from 7 to 8½ times, average 8.4, but in a ♂ and ♀ (M. C. Z. 48008–9) from the same locality it may be the same, *i.e.* approximately 7 times.

Measurements. Largest ♂ (M. C. Z. 48005) measures 183 mm. in length of carapace, 78 mm. in height; largest ♀ (M. C. Z. 48010) measures 191 mm. in length of carapace, 92 mm. in height.

Parasite. Ticks (*Amblyomma nuttalli*) were present on individuals from every locality.

MALACOCHERSUS TORNIERI (Siebenrock)

Testudo tornieri Siebenrock, 1903, Anz. Akad. Wiss. Wien, **40**, p. 185, pl. —: Busisi, s. end of Lake Victoria, Tanganyika Territory.

1 (M. C. Z. 48001) Between Kiponda & Mitungu, T. T. 8.v.39.

Native name. *Kobe* (Kimwera).

Habitat. Though only fifty miles south of Lindi, from which the species has been recorded, the finding of this young, 51 mm., tortoise on the Rondo Plateau was something of a surprise for no rocks were visible in the vicinity. As it was lying dead beside a much-used path, the possibility of its having been transported by native agency should not be overlooked.

PELOMEDUSIDAE

PELOMEDUSA SUBRUFA OLIVACEA (Schweigger)

Emys olivacea Schweigger, 1814, Prodromi Mon. Chelon., p. 38: "In Fabulosis Nigritiae" Adanson coll. = Senegal.

Pentonyx Gehafie Rüppell, 1835, Neue Wirbelth. Fauna Abyss., Amph., p. 2, pl. i: Massaua, Eritrea.

Pelomedusa Gasconi Rochebrune, 1884, Faune Sénégambie, Rept., p. 25, pl. i, figs. 1–2: Dagana, Senegal (restricted).

1 (M. C. Z. 48012) Mabira Forest, U. 14.xi.38.

History. Heretofore all East African marsh terrapin have been referred by me to *P. galeata*, a name which Mertens (1937, Zool. Anz., **117**, p. 139) has shown must give place to *subrufa* Lacépéde, 1788, whose type locality of "Indien" he restricts to the Cape of Good Hope. It is this typical form which occurs throughout Tanganyika and over the greater part of Kenya and Uganda. It is characterized by the pectoral shields forming a suture on the median line of the carapace.

From West Africa we have the name *olivaeca* Schweigger, 1814, and though his description is scanty, the type is still in the Paris Museum. In 1884 another Senegal terrapin was named *gasconi* by Rochebrune, whose plate shows the characteristic separation of pectorals reported by Parker (1936e, 609) from northern Gold Coast, Nigeria, etc. In fact this form appears to stretch in a

belt from Senegal right across to Eritrea from where Rüppell described *gehafie*, of which the Museum of Comparative Zoölogy possesses a cotype.

Intermediates between the two races occur in a wide area of the Anglo-Egyptian Sudan, Ethiopia, British and Italian Somaliland, Kenya (Kaliokwell River, Lake Rudolf, reported by Parker) and Uganda, and it is solely with a view to getting authors to assist in defining this area that I employ the name *olivacea* for this Mabira terrapin in which the pectorals are separated. One (M. C. Z. 40052) of the three terrapin from Kirui's, Mt. Elgon, referred by me to *subrufa* (as *galeata*) in 1936, also has separated pectorals. The condition is rare in East Africa, however, for these are the only instances out of thirty-eight specimens examined.

It is true that the condition of separated pectorals occurs sporadically further south, having been reported from South West Africa (Werner), Angola (Bocage), Transvaal (M. C. Z. 41942) and Madagascar (Mertens), but these do not invalidate the recognition of a northern race for they form such a minute percentage of the predominating typical form in South Africa, or race *wettsteini* in Madagascar.

Native name. *Njaba* (Luganda).

Coloration. Plastron wholly black like those from Kirui's, in sharp contrast with the yellow plastrons from the dry savanna areas.

Pelusios subniger (Lacépède)

Testudo subnigra Lacépède, 1789, Hist. Nat. Quadrup. ovip. Serpens, **2**, Synopsis methodica: (Based on *La Noiratre* of Lacépède).

♀ (M. C. Z. 48013) Butiaba, U. 29.xi.38.

Synonymy. Sternfeld (1912c, pp. 200–201) records two terrapin from Lake Albert. One from Butiaba (misspelt Rutiala), he refers to *Pelomedusa galeata*, the other from Kassanje on the Congo shore he identified as *Sternothaerus sinuatus.* Nieden (1913c, Mitt. Zool. Mus. Berlin, **7**, p. 61) reexamined both specimens and found them to be *nigricans*, a name which is antedated by *subniger* Lacépède, though not by *subniger* Daudin.

Tornier (1896, p. 4) recorded *sinuatus* from Sesse Islands (misspelt Ussi), as did Boulenger (1909b, Ann. Mus. Civ. Stor. Nat. Genova (3) **4**, p. 302). The latter author (1911c, *loc. cit.* (3), **5**, p. 162) also recorded *derbianus* from Bussu, near Jinja, the only Uganda records for either species. Having doubts regarding them, I took the oppor-

tunity of examining this material — through the courtesy of Dr. Oscar de Beaux — when passing through Genoa. Both specimens are referable to *subniger*, for after careful investigation I have come to the conclusion that *derbianus* cannot be recognized as even subspecifically distinct.

I (1923g, p. 930) made a similar mistake, repeating (1928d, p. 51) it when I referred a 360 mm. skeletal carapace from the Ruaha River to *nigricans* (i.e. *subniger*) for the characteristic youthful characters of a posteriorly serrated carapace and protruberances on the verteral shields are blurred in this very old specimen. All these errors arose from the literal use of the keys supplied by Boulenger (1889a, p. 192) whose material was inadequate. We have then in East Africa only two members of the genus, both characterised by the suture between the abdominal shields being less, often considerably less, than the length of the anterior lobe of the plastron. A key for separating all the members of the genus will be found in my (1941d, p. 482) Revision of the Pelomedusidae.

PELUSIOS SINUATUS (Smith)

Sternotherus sinuatus A. Smith, 1838, Ill. Zool. S. Africa, Rept., pl. i: In rivers to the north of 25° S., South Africa.

6 (M. C. Z. 48014–9) Ujiji, T. T. 10.iii.39.
6 (M. C. Z. 48020–5) Mbanja, T. T. 27.iv.39.

Native name. *Ngongo* (Kimakonde).

Variation. The present material, coming as it does from points 750 miles apart on the western and eastern shores of Tanganyika Territory, is of interest as both series exhibit the outer edge of the pectoral usually longer than, sometimes equal to, occasionally shorter than, the outer border of the humeral; anterior lobe of the plastron longer than the abdominal suture in all because they are young, with carapace lengths of from 51 to 173 mm. in length. The height is included in this length from 2.39 to 2.68 times.

Coloration. All present the characteristic angular black pattern on the periphery of the yellow (brick red in four youngest) plastron.

Breeding. On March 10 and April 27 I was brought two hatchlings from each locality, all had a carapace length of 51 mm., but the two from Ujiji had a height of 21 mm., those from Mbanja of 19 mm.

Defence? The largest (173 mm.) of these terrapin, on being picked up and turned over, ejected a fine jet of fluid from its right axilla

or shoulder, I could not see clearly which, to a distance of one foot, a second jet followed from the region of insertion of the left fore leg, then a third from the right hind leg.

Habitat. The day following our arrival at Ujiji I visited the old cement cistern, an abandoned sugar refinery vat, from which I had removed two young *sinuatus* and two large *Rana occipitalis* on May 28, 1930. After waiting quietly for a few minutes I saw the stagnant surface broken by the snout of a terrapin which was as quickly withdrawn. I set the two skinners to work to bail out the 150 gallons of water in the bottom of the vat. It took them three hours to drain it and we found only three terrapin the largest of the series. From this it might be deduced that one terrapin falls into the vat every three years, escape being impossible: fish being abundant in Ujiji makes it improbable that a hungry native would take the trouble to capture an odiferous terrapin. It was interesting to note that there were no frogs present; though many frogs and toads of different species were captured in the three adjacent vats which, being cracked, held only a few inches of water at most. It seems reasonable to assume, therefore, that those which had fallen into the vat containing terrapin, had been eaten by the latter.

AMYDIDAE

CYCLODERMA FRENATUM Peters

Cycloderma frenatum Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 216: Zambezi, Mozambique.

8 adult (M. C. Z. 48026–33) Kitaya, T. T. 24–31.iii.39.
36 eggs (M. C. Z. 48034) Kitaya, T. T. 27–28.iii.39.

Native names. Litetamera (Kiyao); *nahi* (Kimakonde).

Variation. The four alcoholics present a very different appearance from the four dried carapaces. The longitudinal dermal ridges, so conspicuous on the carapace of a young alcoholic cotype (M. C. Z. 21901), are absent from the smooth carapaces of the alcoholic adults, though perhaps indicated laterally. The entoplastral bony callosity exhibits surprising variability not only in size but in shape; the hyoplastral and hypoplastral callosities, said to be widely separated by Boulenger (1889a, p. 265) are rarely so in this series, normally they are closely in contact.

Coloration. In life. Above, very dark olive; except for one lateral line, the dark longitudinal lines on head and neck are not conspicuous

as figured by Peters (1882a, Reise nach Mossambique, **3**, pl. i). Below, fleshy pink and china white much variegated with dusky marblings (still the case in alcohol). Perhaps this is the ♀ coloring (*vide* Peters, 1882a, pl. iiia) while his pl. i may be based on ♂ coloring, it agrees well with the plastral appearance of our young Zambezi cotype.

Measurements. Length of carapace (without dermal margins) of largest gravid ♀ (M. C. Z. 48030) 390 mm., width of carapace (without margins) 310 mm. Weight 25 lbs.

Breeding. This ♀, taken April 27th, held 17 hard-shelled spherical eggs, each measuring 32 mm. in diameter, and ready for laying: in addition there were 55 smaller ova in various stages of development. The following day a second ♀ was found to hold 19 hard-shelled eggs, each approximately 31 mm. in diameter, besides numerous developing ova.

The fact that all four dissected specimens are females, suggests that the whole series are of that sex and so had fallen an easy prey to natives when they had ventured ashore to lay. I surprised one about twenty feet from the edge of a great hippo-harbouring lagoon for which it was making in leisurely fashion. On seeing me it speeded up, I gave chase and we captured it in the water.

Diet. If an inference may be drawn from the fact that each of these turtles had a powerful, all-pervading fishy odour, it seems probable that they subsist largely on fish.

Parasites. Leaches were not uncommon on these mud turtles.

Enemies. Dr. J. O. Shircore, C.M.G., when Director of Medical Services in Tanganyika Territory, related to me how, about 8 a.m. one morning in 1926, he had encountered two small rufous otters. They were running around an almost dessicated puddle about a hundred yards from the right bank of the Kilombero River in Mahenge district; then he observed that they were attempting to eat one of these mud turtles which had withdrawn within its defences, at least this was the position when he walked up after shooting one of the otters. Subsequently he sent me a photograph of otter and turtle, the latter lying on its back, the former posed in much the same position as when shot.

Temperament. Contrary to my expectations, these turtles appear timid and inoffensive, withdrawing their heads and enclosing the hind limbs beneath their protective dermal valves at the slightest disturbance. When all is quiet, the head is protruded with the utmost caution by very gradual stages, to be withdrawn precipitately, to the

accompaniment of a species of snort, at the slightest sound or movement in their vicinity.

Encountering a native on a path one day, I stopped and spoke to him of my requirements in the way of small mammals, then passed on without paying any particular attention to the burden on his head which appeared to be a shallow cooking pot of sorts. He called after me to know if I had no need of turtles, then I saw that it was one of these, plastron uppermost, which he was carrying: the usual ring of twisted grass, commonly employed by porters to balance their loads, had been used to steady the strongly convex carapace. The docile reptile had been transported several miles in this manner.

Habitat. With head held well above the water, one of these turtles paddled swiftly past me when I was wading thigh-deep in the leech infested waters of a lake. I was stalking duck at the time and, lest I shatter it, had to wait till the turtle was twenty feet away before firing. However it dived and was not seen again.

TYPHLOPIDAE

TYPHLOPS SCHLEGELII MUCRUSO (Peters)

Onychocephalus mucruso Peters (part), 1854, Monatsb. Akad. Wiss. Berlin, p. 621: Makanga, Mozambique.

3 (M. C. Z. 48007–9) Mikindani, T. T. 15.iv.39.
2 (M. C. Z. 48090–1) Mbanja, T. T. 1.v.39.
2 (M. C. Z. 48092–3) Lake Rutamba, T. T. 8.v.39.
1 (M. C. Z. 48094) Lindi town, T. T. 1.vi.39.

Native names. *Nanumira kuwiri* (Kimakonde); *lilenga* (Kimawiha.)

Variation. Midbody scale-rows 30–34; diameter included in length 24–40 times.

Coloration. The Mikindani series correspond to the gray *lineolatus* type of *punctatus;* the rest resemble the *congestus* variety of the same species, being orange with black blotches at Mbanja, blue gray with black blotches at Rutamba and Lindi.

Measurements. Largest (M. C. Z. 48090) measures 515 (510 + 5) mm., diameter 21 mm.

Enemies. As I was passing through some native gardens near Mbanja, I saw a woman with a ten-foot pole belabouring something on the ground at the back of her hut; her small daughter, awestruck, looked on from a safe distance. The object of attack was the large and helpless blind snake whose measurements are given above.

TYPHLOPS BLANFORDII LESTRADEI Witte
Plate 2, fig. 2.

Typhlops Lestradei Witte, 1933, Revue Zool. Bot. Afr., **23**, p. 206, figs. 1–3: "Rubengera" *i.e.* Ruhengeri, Belgian Ruanda-Urundi.

Eggs and 8 (M. C. Z. 48070–8) Mushongero, U. 1–3.ii.39.
3 (M. C. Z. 48079–81) Nyakabande, U. 5.ii.39.
3 (M. C. Z. 48082–3) Kisenyi, B. R. 10.ii.39.
4 (M. C. Z. 48084–6) Idjwi Id., B. C. 17.ii.39.

Native names. *Kirumira habili* (Lukiga); *kichulachuzi* (Lulega).

Synonymy. Witte distinguishes *lestradei* from *blandfordii* Boulenger on four characters, all of which are now shown to be inconstant. *T. blanfordii* of Ethiopia had 30 midbody scale-rows, but so does *lestradei* occasionally; the eye in the former was distinct whereas in *lestradei* it is usually hidden, though sometimes sharply distinct (M. C. Z. 48071, etc.); the relative proportions of the head shields exhibit too much variability to be considered, the prefrontal, though usually larger than the supraoculars in *lestradei*, is sometimes subequal. There remains then, only the character of the rostral, as seen from below, being broader in the figure of *blanfordii* than in *lestradei*, in which it narrows rather abruptly towards the buccal border. Direct comparison, however, of a specimen of *blanfordii* from Harrar, Ethiopia, with our *lestradei* material, reveals no difference. There is, though, an average difference in midbody scale-rows and diameter, so I prefer to regard *lestradei* of western Uganda and Ruanda, as a race of *blanfordii* of Eritrea, Ethiopia (and possibly Kenya, *fide* Sternfeld).

It seems possible that *T. dubius* Chabanaud (1916f, Bull. Mus. Paris, **22**, p. 364) may take precedence over *lestradei*. This snake had 30 midbody scale-rows but its diameter into length was said to be about thirty times, both of which would put it in the synonymy of *punctatus*. The snout is allegedly similar to that of *blanfordii*, but as Chabanaud's holotype was young — only 147 mm. — the slightly more angular snout of adult *punctatus* would not be emphasized. Much turns on the type locality, said to be "Congo belge: volcans du Kivori (altitude 1,500 mètres)." This certainly appears to be the Kivu volcanoes, but I am informed that the collector was very careless in labeling his material and that insects labeled from the volcanoes, never came from there. There is a Kivari in Uganda to the east of Ruwenzori so perhaps the name is repeated somewhere in the Congo.

Chabanaud suggests that *dubius* may be a synonym of *adolfi* Sternfeld (1910e. p. 70), described as from "Fort Blus" but later (1912c, p. 263) corrected to Fort Beni. *T. adolfi*, however, seems certainly a synonym of *punctatus* for it not only had 30 midbody scale-rows, but a diameter which was included in its length twenty-five times. We have typical *punctatus* from Irumu which is just west of Fort Beni.

Measurements. Largest (M. C. Z. 48071) measures 670 (662 + 8) mm., diameter 15 mm., smallest (M. C. Z. 48081) measures 195 (192 + 3) mm., diameter 6 mm.

Coloration. A very glossy species. Above, gray, plumbeous, black or rich coppery or bronzy brown, the basal half of each dorsal scale lighter. Below, belly somewhat lighter (Mushongero), or median region of belly irregularly white (Kisenyi and Idjwi). When about to slough, sometimes uniformly opaquely white.

Breeding. At Mushongero, on February 3, 9 eggs, each measuring about 27 x 14 mm., in a ♀.

Diet. One very fat Idjwi snake held termite nymphs, the stomach contents of a second have been identified for me as larval and callow ants by Dr. P. J. Darlington.

Enemies. Remains of one in stomach of a *Miodon g. graueri* on Idjwi Id.

Habitat. I captured the Nyakabande series in the course of an hour by turning over the larger blocks of lava lying scattered about on the plain in the vicinity of the rest house. The snakes immediately attempted to slip down holes among the interstices of the lava and it was necessary to pry up the rocks to extricate the larger snakes, so tenaciously did they hold on. A Kisenyi snake was hoed up by a woman working in her garden. The fine Mushongero series were brought me in a basket by a native who said that he had dug them from termite hills, capturing them alive and uninjured.

Typhlops punctatus punctatus (Leach)

Acontias punctatus Leach, 1819, in Bowdich, Miss. Ashantee, p. 493: Fantee, Gold Coast.

2 (M. C. Z. 48059–60) Mabira Forest, U. 5 & 14.xi.38.
5 (M. C. Z. 48061–5) Magrotto Mtn., T. T. 1–12.vii.39.

Distribution. It was curious that this common species was encountered only at the first and last camps of the entire trip, and

that it is the typical form and not the race *gierrai* which occurs at Magrotto.

Native names. *Mugova* (Luganda); *mkonko* (Kisambara).

Variation. Midbody scale-rows 26–28; diameter included in length 27–36 times; tail included in length 42–79 times; preocular in contact with upper labials.

Coloration. All of the *lineolatus* type, adults bronzy brown or gray, juveniles gray or black.

Measurements. Largest, a ♀ (M. C. Z. 48061), measures 557 (550 + 7) mm.

Breeding. On July 1, this largest snake held 19 small eggs measuring 10 x 5 mm. On July 12, a ♀ only 30 mm. smaller held 10 eggs of varying sizes, the largest measuring 17 x 7 mm.

Aestivation. Both the largest snakes, 540 and 557 mm. respectively, from Mabira and Magrotto, had extensive deposits of fat and were killed while crossing roads after heavy rain.

Folklore? Apropos previous remarks (*vide* Barbour & Loveridge, 1928, p. 108), it was a curious coincidence that, within an hour of my arrival at Magrotto, Mr. C. Clausen, Manager of the Estate, should produce a bottle containing one of these snakes, saying "Perhaps you can tell us about this creature. It was brought to me by a native who found it wriggling unharmed in a procession of *siafu* (driver ants); he split a bamboo with which he removed it from their line and brought it to me saying that the creature was their queen."

TYPHLOPS TETTENSIS RONDOENSIS subspec. nov.

Type. Museum of Comparative Zoölogy, No. 48,066, from Nchingidi, 2,700 feet, Rondo Plateau, southeastern Tanganyika Territory, collected by Arthur Loveridge, May 5, 1939.

Paratypes. Museum of Comparative Zoölogy, Nos. 48067–9 and a fifth specimen in the British Museum, all with same data as the type.

Diagnosis. Midbody scales in 24 (22–24 in *obtusus*) rows, snout very prominent, rounded.

Preocular in contact with second, third and fourth labials; distance between rostral and nostril about equal to distance between latter and posterior edge of nasal; midbody diameter 36 to 45 times in total length.

Belly bluish gray like back; rostral not extending back to an imaginary line connecting the anterior borders of the eyes (Tette, Zambezi, Mozambique) . . . . *t. tettensis*

Belly pure white; rostral extending back to an imaginary line connecting the anterior borders of the eyes (Rondo Plateau, Tanganyika Territory) . . . . *t. rondoensis*

Preocular in contact with second and third labials only; distance between rostral and nostril about one third of the distance between latter and posterior edge of nasal; midbody diameter 43 to 50 times in total length.

Belly pure white; eyes concealed, but rostral apparently not extending back to an imaginary line level with their probable position (Shire Highlands, Nyasaland) . . . . *t. obtusus*

Description. Midbody scale-rows 24 in all; midbody diameters included 36 to 45 times in total length; length of tails included 57 to 78 times in total length; agreeing with *tettensis* in all respects except for those characters indicated in the diagnosis, and an azygous scale split off from the second labial on one side of one specimen.

Coloration. In life. Above, blue-gray, thus closely resembling the young of *punctatus* and *schlegelii mueruso.* Below, china white. In alcohol while the bluish gray effect is retained, a close examination reveals each dorsal scale as blackish at the tip, white at the base, resulting in a lineolate appearance. Below, white. Thus they differ from *tettensis* which were: "Im leben grünblau, in Weingeist überall graugrün."

Measurements. Total length of Type, 228 (224 + 4) mm.; midbody diameter 5 mm. The paratypes range from 145 to 165.5 mm. in length, with diameters of from 4 to 5 mm. Probably none are fullgrown.

Habitat. All taken under logs at the forest edge and within two hundred yards of my camp, to be described in the final report.

Remarks. T. tettensis is known only from the types in the Berlin Museum and therefore unavailable at the moment of writing. The types of *T. obtusus* are in the British Museum and I am indebted to Mr. H. W. Parker for making comparison between them and a paratype of *rondoensis,* which he considers to be distinct from *obtusus.* It was he who pointed out the difference in position of the nostril, which is more anteriorly situated in the nasal plate in *obtusus.*

Typhlops unitaeniatus unitaeniatus Peters

Typhlops (Letheobia) unitaeniatus Peters, 1878, Monatsb. Akad. Wiss. Berlin, p. 205, pl. ii, fig. 5: Teita, Kenya Colony.

1 (M. C. Z. 48058) Amboni, T. T. 14.vi.39.

Variation. Midbody scale-rows 24; diameter included in length 83 times.

Measurements. Total length 332 (307 + 25) mm., midbody diameter 4 mm.

Diet. Termites in its stomach.

Enemies. Taken from the stomach of a lizard-buzzard (*Kaupifalco monogrammica*) shot shortly after sunset: the snake could have been swallowed only very recently.

Typhlops graueri Sternfeld

Typhlops graueri Sternfeld, 1912, Wiss. Ergeb. Deut.-Zentral-Afrika-Exped· 1907–1908, **4**, p. 264: Virgin forest behind boundary mountains northwest shore of Lake Tanganyika, Belgian Ruanda-Urundi.

7 (M. C. Z. 48051–7) Ujiji, T. T. 11–15.iv.39.

Variation. Midbody scale-rows 24; diameter included in length 67–75 times.

Measurements. Largest (M. C. Z. 48051) measures 366 (360 + 6) mm., midbody diameter 5 mm.

Habitat. I took three beneath rotting debris piled about the base of a mango tree in a *shamba* between township and shore; the rest in soil beneath garden refuse in plantations of bananas, etc. in nearby Ruanda, T.T., as in 1930 (*vide* Loveridge, 1933h, p. 212).

Typhlops braminus (Daudin)

Eryx braminus Daudin, 1803, Hist. Nat. Rept., **7**, p. 279: Bengal, India.

2 (M. C. Z. 48049–50) Lindi, T. T. 31.v.39.

Distribution. These constitute the fourth and fifth records of the occurence of *braminus* along the coast of Tanganyika. My colleague, Mr. Shreve, recently found two (M. C. Z 33602–3) in a collection from Chilpancingo, Mexico, so that it is incorrect to limit its distribution to Asia and the islands of the Indian Ocean.

Variation. Midbody scale-rows 20; diameter included in length 48–55 times.

Measurements. Larger (M. C. Z. 48049) measures 145 (141.5 + 3.5) mm., midbody diameter 3 mm.

Habitat. Found together beneath bundles of rotting grass stacked in native town near the Beach Hotel. Diligent search failed to uncover any more.

Typhlops lumbriciformis (Peters)

Onychocephalus (Letheobia) *lumbriciformis* Peters, 1874, Monatsb. Akad. Wiss. Berlin, p. 377: Zanzibar coast.

4 (M. C. Z. 48045–8) Amboni, T. T. 19.vi.39.

Variation. Midbody scale-rows 18; diameter included in length 61–72 times; tail included in length 55–65 times.

Measurements. Largest (M. C. Z. 48048) measures 360 (354 + 6) mm., midbody diameter 5 mm.

Habitat. Ploughed up by tractor in a sisal plantation on Amboni Estate, near Tanga.

LEPTOTYPHLOPIDAE

Leptotyphlops conjuncta conjuncta (Jan)

Stenostoma conjuncta Jan, 1861, Arch. Zool. Anat. Fisiol., **1**, p. 189: South Africa.

1 (M. C. Z. 48035) Kitaya, T. T. 5.iv.39.

Native name. Nanumira kuwiri (Kimakonde at Kitaya).

Variation. Midbody scale-rows 14; diameter included in length 45 times; tail included in total length 12 times.

Trinomials are used, following Bogert (1940, p. 13) who regards *distanti* as a race.

Measurements. Total length 135 (123 + 12) mm.; midbody diameter 3 mm.

Leptotyphlops emini emini (Boulenger)

Plate 2, fig. 1.

Glauconia emini Boulenger, 1890, Ann. Mag. Nat. Hist. (6), **6**, p. 91: Karagwe, Bukoba, Tanganyika Territory.

2 (M. C. Z. 48036–7) Bundibugyo, U. 20.xii.38.
5 (M. C. Z. 48038–42) Mbanja, T. T. 26.iv.39.

Native names. Kikelere (Luamba); *keechwa mugongo* (Lutoro); *mbitu* (Kimakonde at Mbanja where they did not know the name given me at Kitaya for *L. conjuncta,* and apply *mbitu* to amphisbaenids also).

Variation. Midbody scale-rows 14; diameter included in length 40–45 times; tail included in length total 9–13 times.

Measurements. Largest, a ♀ (M. C. Z. 48037), measures 145 (131 + 14) mm., midbody diameter 3.25 mm.

Habitat. Two of the Mbanja series were taken just below the surface (rainy season) in uprooting rank grass and scraping over tent site.

Leptotyphlops longicauda (Peters)

Stenostoma longicauda Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 621: Tete, Mozambique.

2 (M. C. Z. 48043–4) Mbanja, T. T. 27.iv.39.

Native name. Mbitu (Kimakonde, but see remarks under *L. emini*).

Variation. Midbody scale-rows 14; diameter included in length 72–81 times; tail included in total length 9–11 times.

Measurements. Larger measures 102 (93 + 9) mm., midbody diameter 1.25 mm.

BOIDAE

Python sebae (Gmelin)

Coluber sebae Gmelin, 1788, Syst. Nat., **1**, p. 1118: No type locality.

2 (M. C. Z. 48095–6) Ujiji, T. T. 10.iii.39.
1 (M. C. Z. 48097) Mikindani, T. T. 10.iv.39.

Distribution. The only other python seen was at Mubango, where I refused to purchase a heavy eight-foot specimen that had been dragged for four miles through the Mabira Forest, Uganda.

Native names. Timba (Luganda); *mbira* (Luamba); *nzilamiri* (Lutoro); *satu* (Kiyao); *hato* and *ihatu* (Kimakonde at Mikindani and Kitaya); *mbidi* (Kimakonde at Mbanja).

Variation. Midbody scale-rows 83–91; ventrals 274–278; anal entire; subcaudals 75–77.

Measurements. Largest (M. C. Z. 48095) measures 2500 (2170 + 330) mm.

Diet. The largest python disgorged a fowl when struck.

Parasites. Three nematodes (*Ophidascaris sp.*) from its stomach were preserved.

COLUBRIDAE

NEUSTEROPHIS OLIVACEUS OLIVACEUS (Peters)

Coronella olivacea Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 622: Tete, Mozambique.

2 (M. C. Z. 48098) Mushongero, U. 1.ii.39.
1 (M. C. Z. 48099) Idjwi Id., B. C. 3.iii.39.
1 (M. C. Z. 48100) Ujiji, T. T. 11.iii.39.
4 (M. C. Z. 48101–2) Magrotto Mtn., T. T. 3.vii.39.

Native names. Bulifu (Lukiga, but not distinguished from *Duberria*); *kashaveri* (Lulega).

Variation. Midbody scale-rows 19; ventrals 135–140; anal divided; subcaudals 46–67; labials 8, the fourth and fifth entering the orbit; preocular 1, rarely 2 (left side of M. C. Z. 48099 only); postoculars 3, rarely 2 (right side of M. C. Z 48099 only); 5, rarely 4, infralabials in contact with an anterior sublingual.

Coloration. One Mushongero snake had the lateral edges of the ventrals impinged with magenta, the other with gray. The Idjwi Island reptile was uniform olive above, the olive only slightly impinging on the ventrals which were otherwise paler olive. The Ujiji ♀ was distinctly reddish with a broad, dark vertebral band, the red impinging on the lateral edges of the ventrals which were otherwise white.

Measurements. Largest, a ♀ (M. C. Z. 48162), measures 390 (280 + 110) mm. A larger ♂, as well as two others of the series, had lost the tip of its tail.

Habitat. One Mushongero snake was hoed up in grassland near the lake shore. It is interesting to note that both races occur on Magrotto, those listed above were brought to me by natives and may well have come from the long-cultivated areas lower down the mountain as those taken by myself at the forest edge had all the 17 midbody scale-rows of the montane forest race.

NEUSTEROPHIS OLIVACEUS ULUGURUENSIS Loveridge

Natrix olivacea uluguruensis Loveridge, 1935, Bull. Mus. Comp. Zoöl., **79**, p. 7: Nyange, Uluguru Mountains, Tanganyika Territory.

6 (M. C. Z. 48103–5) Magrotto Mtn., T. T. 3–9.vii.39.
9 (Vienna Museum) Ugano, Matengo Highlands, T. T.

Distribution. I have included some material submitted by the Vienna Museum as it constitutes a southward extension of the range.

The race reaches Southern Rhodesia, however, for FitzSimons (1939b, Ann. Transvaal Mus. **20**, p. 20), under the name *olivaceus*, records three snakes from the Chirinda Forest, Mt. Selinda, as having 17 midbody scale-rows.

Native name. *Nyoka usambia* (Kisambara, also for *Aparallactus werneri*).

Variation. Midbody scale-rows 17, except one (Vienna Mus.) with 16 and one with 15 (M. C. Z. 44093), both from Ugano. Heretofore the only example with 15 rows known to me, was from Pemba Island; perhaps the island race may not be recognisable, a point which can be definitely settled by someone on Pemba securing a series of these snakes. Ventrals 130–140; anal divided; subcaudals 63–83; labials 8, the fourth and fifth entering the orbit; preoculars 1 or 2 (latter in four of the Ugano series); postoculars 3, rarely 2 (M. C. Z. 48164 only); temporals 1 + 2, rarely 1 + 1 and 2 + 2 (Vienna specimens); 5, rarely 4, infralabials in contact with an anterior sublingual.

Coloration. A Magrotto ♂ was noted as having creamy-white ventrals, those of two ♀♀ were as bright yellow as those of *Aparallactus werneri.*

Measurements. Largest ♂ (M. C. Z. 48163) measures 373 (265 + 108) mm., largest ♀ (M. C. Z. 48165) 394 (275 + 119) mm. This refers to Magrotto series only, largest from Ugano (unsexed) measures 411 (287 + 124) mm.

Diet. A frog (*Arthroleptis xenodactylus*) in one.

Parasites. A nematode.

Bothrophthalmus lineatus lineatus (Peters)

Elaphis (Bothrophthalmus) lineatus Peters, 1863, Monatsb. Akad. Wiss. Berlin, p. 287: Guinea.

♂ (M. C. Z. 48106) Mabira Forest, U. 14.xi.38.

Distribution. The typical form ranges from French Guinea eastwards to the Mabira Forest, Kyagwe, where one has already been taken by Pitman (1936, p. 227). In Fernando Po and on the opposite mainland of southwestern Cameroon, the uniformly coloured race *brunneus* Günther (with *infuscatus* Buchholz & Peters, *modestus* Fischer, and *olivaceus* Müller, as possible synonyms) is given off.

Variation. Midbody scale-rows 23; ventrals 192; anal entire; subcaudals 72; labials 7, the fourth and fifth entering the orbit.

Coloration. Above, head white with fine black lines on top and side, the usual five vertebral and lateral coral red stripes separated

by the black ground colour. Below, throat white, rest of undersurface coral red.

Measurements. ♂ measures 670 (550 + 120) mm.

Boaedon lineatus lineatus Duméril & Bibron

Boaedon Lineatum Duméril & Bibron, 1854, Erpét. Gén., **7**, p. 363: Gold Coast.

5 (M. C. Z. 48107–9) Mabira Forest, U. 14–18.xi.38.
1 (M. C. Z. 48110) Fort Portal, U. 19.xii.38.
1 (M. C. Z. 48111) Bugoye, U. 27.xii.38.
12 (M. C. Z. 48112–9) Nyakabande, U. 28–30.i.39.
Eggs & 4 (M. C. Z. 48120–4) Mushongero, U. 1–2.ii.39.
9 (M. C. Z. 48125–9) Kisenyi, B. R.-U. 10–13.ii.39.
10 (M. C. Z. 48130–4) Idjwi Id., B. C. 23–28.ii.39.
10 (M. C. Z. 48135–9) Ujiji, T. T. 11–15.iii.39.
5 (M. C. Z. 48140–2) Kitaya, T. T. 25–31.iii.39.
14 (M. C. Z. 48143–53) Mikindani, T. T. 10–20.iv.39.
4 (M. C. Z. 48154–6) Mbanja, T. T. 27–30.iv.39.
15 (M. C. Z. 48157–69) Nchingidi, T. T. 10–19.v.39.
1 (M. C. Z. 48170) Siga Caves, T. T. 15.vi.39.
5 (M. C. Z. 48171–3) Amboni Estate, T. T. 19.vi.39.
14 (M. C. Z. 48174–84) Magrotto Mtn., T. T. 1–19.vii.39.

Native names. Kifuta (Luganda); *nyamutane* (Lukonjo); *namajina* (Lukiga); *namaragwe* (Kimwera); *nyika* (Kisambara); while the following Kimakonde names were given me: *namalutu* (at Kitaya), *naliohi* (at Mikindani), *mambala* and *gangganguru* (at Mbanja) which suggest that confusion with some other species exists.

Variation. Midbody scale-rows 27–33, there is an interesting tendency to have only 27–29 on the East Coast where only four out of fifty-eight snakes have 30 or 31, none has 33; on the other hand, in the Central Lake region only one out of fifty-two snakes has 33 and none has 27, all the rest having 29–31[1]; ventrals 196–218, reflect the same tendency being 187–218 at coast and 196–235 in Lake region; anal entire; subcaudals 46–70, the coast alone embracing whole range; upper labials normally 8, the fourth and fifth entering the orbit, rarely 7, the fourth entering (1 ex.), or 8, the third, fourth and fifth (7 ex.), or 9, the fourth and fifth (2 ex.), or 9, the fourth, fifth and sixth (2 ex. one side only), or 9, the fifth and sixth (2 ex. one side only); 3 or 4, very rarely 1 or 2, lower labials in contact with the anterior sublinguals, in one snake the second sublabial on either side is excluded from contact with the sublinguals; loreal

[1] Cf. Loveridge, 1936j, p. 238, for similar comparison to the north.

present except in M. C. Z. 48109 where they are fused with the prefrontals; preoculars 1 (65 ex.) or 2 (39 ex.), the rest having an azygous combination, one snake (M. C. Z. 48181) lacking a preocular on the right side owing to fusion with the prefrontal; postoculars 2; temporals 1 + 2, rarely 1 + 1 (5 ex. at least on one side) or 1 + 3 (9 ex. at least on one side).

Coloration. In Mabira Forest an adult was olivaceous, a young one blackish. An adult ♀ from Ujiji decidedly greenish, a second specimen black. Another ♀ from Mikindani was pale brown above, a red bar from nostril through orbit becoming less distinct posteriorly, about five, irregular, longitudinal rows of red blotches on the dorsum also become less distinct posteriorly. Below, pure white.

Measurements. Largest ♂ (M. C. Z. 48157) measures 650 (540 + 110) mm.; largest ♀ (M. C. Z. 48135) measures 951 (835 + 116) mm.

Sexual dimorphism. The ♂♂ have a lower ventral and higher subcaudal count, viz. 35 ♂♂ range from 191–212 ventrals and 57–70 subcaudals, while 19 ♀♀ range from 205–239 ventrals and 46–53 subcaudals, the tails of the ♀♀ being noticeably shorter.

Breeding. The following records of developing eggs were made. Ujiji, March 11, 1939, ♀ held 2 eggs measuring 20 x 10 mm. Kitaya. March 25, 1939. ♀ held 8 eggs measuring 15 x 9 mm. While at Mushongero, February 2, 1939, 6 eggs measuring 40 x 24 mm. were found in a termitarium. They contained young measuring 220 (185 + 35) mm. which, on hatching a month later, measured 234 (205 + 29) mm.

Diet. Rodent fur in a Kisenyi snake, that of a jumping rodent in a Mikindani reptile. Rats (*Rattus r. kijabius*) recovered from Fort Portal and Ujiji specimens; pigmy mice (*Leggada spp.*) from Mabira, Ujiji and Kitaya snakes; a mouse (*Lophuromys a. aquilus*) at Nyakabande; an arboreal rat (*Thamnomys s. surdaster*) in a Magrotto snake; and a tree mouse (*Dendromus l. kivu*) in one of the Idjwi Island series.

A gecko (*Hemidactylus mabouia*) with tail intact in a Kitaya snake; a young lizard (*Gerrhosaurus n. nigrolineatus*) and adult skink (*Ablepharus wahlbergii*) in Nchingidi specimens. Of frogs *Rana m mascareniensis* at Siga Caves, *Arthroleptis adolfi-friederici* on Magrotto Mountain, *A. s. stenodactylus* and *Hemisus m. marmoratum* in Mikindani snakes.

It was noticeable that the pigmy mice, lizards, and frogs were swallowed by the smaller snakes, the larger rodents, such as the

mole rat (in M. C. Z. 48135) measuring 350 (190 + 160) mm., by the adult reptiles.

Parasites. Ticks on Nyakabande, Ujiji, and Kitaya snakes; worms (*Ophidascaris sp.*) in Kisenyi and (*Polydelphis sp.*) in Amboni specimens.

Habitat. Under palm fronds and other vegetation, as well as under logs; others were taken in native huts according to their captors.

BOAEDON OLIVACEUS (Duméril)

Holuropholis olivaceus A. Duméril, 1856, Rev. Mag. Zool. (2), **8**, p. 466: Gaboon.

1 (M. C. Z. 48185) Mabira Forest. U. 5.xi.38.
5 (M. C. Z. 48186–90) Bundibugyo, U. 22.xii.38.

Native name. *Kiliba* (Luamba).

Variation. Midbody scale-rows 27–31; ventrals 208–224; anal entire; subcaudals 41–48; labials 8, the fourth and fifth, or (M. C. Z. 48187) third, fourth and fifth entering the orbit; frontal once to once and a quarter as long as broad, as long as, or shorter, than its distance from end of snout.

Measurements. Largest ♀ (M. C. Z. 48190) measures 782 (695 + 87) mm.

Breeding. One Bundibugyo snake held very small eggs, in another they measured 39 x 18 mm., but several were smashed.

Diet. Mouse fur in stomach of latter.

LYCOPHIDION MELEAGRIS Boulenger

Lycophidium meleagris Boulenger, 1893, Cat. Snakes Brit. Mus., **1**, p. 337, pl. xxi: Ambriz and Ambrizette, Angola.

4 (M. C. Z. 48267–70) Magrotto Mtn., T. T. 8–21.vii.39.

Variation. Midbody scale-rows 15; ventrals 149–160; anal entire; subcaudals 25–36; labials 8, the first in contact with the posterior nasal, third, fourth and fifth entering the orbit.

Coloration. A young ♂ reminded me of *L. c. uzungwensis* in that a salmon pink band follows the contour of the snout from eye to eye, being narrowly edged above with buff and below with black. An adult ♂, ♀, and a young ♀ exhibited only the buff band. In all, the slightly bluish white flecks on the glossy black scales of the back and flanks present a very handsome appearance.

Measurements. Larger ♂ (M. C. Z. 48268) measures 301 (260 + 41) mm.; larger ♀ (M. C. Z. 48267) measures 303 (275 + 28) mm., both

being exceeded slightly by Usambara and Uluguru specimens in the collection.

Diet. The stump of a tail and two eggs of the montane forest skink (*Lygosoma kilimense*).

Defence. On being disturbed these snakes make no attempt to bite but flatten themselves greatly, often coiling as well.

Habitat. In East Africa this is a truly sylvicoline species and I captured all the above snakes among drifted leaves between buttress roots of giant trees in the depths of the forest.

Lycophidion capense ornatum Parker

Lycophidion ornatum Parker, 1936, Novit. Zool., **40**, p. 122: Congulu, Angola.

1 (M. C. Z. 48191) Bugoye, U. 23.i.39.
1 (M. C. Z. 48303) Nyakabande, U. 27.i.39.
1 (M. C. Z. 48192) Mushongero, U. 2.ii.39.
57 (M. C. Z. 48193–249) Idjwi Id., B. C. ii.39.
1 (M. C. Z. 48250) Ujiji, T. T. 11.iii.39.

Distribution. New for Tanganyika Territory and Kenya Colony (see below).

Native name. Busugu (Lulega). Thought to be the young of *Boaedon lineatus* by Kigezi natives.

Corrigenda. This snake is readily distinguishable from *L. c. capense* in the field by the double series of dark spots along the entire length of the dorsum, difficult to detect after formalin preservation. I (1936j, p. 241) commented on this under *L. c. capense* where I erroneously stated that: "This difference is not correlated with any scale characters enabling me to separate them." Parker (1936c, p. 122) with greater perspicacity detected that the first labial is constantly separated from the postnasal in *ornatum*, whereas it is in contact in *capense*. Unfortunately my paper was in press before Parker's reached me. The specimens which should be removed from *capense* in the citation (1936j, p. 241) given, are:

1 (M. C. Z. 39966) Kigezi district, U.
3 (M. C. Z. 40468–70) Sipi, Mt. Elgon, U.
4 (M. C. Z. 40471–3) Kaimosi, K. C.

The other Mount Elgon specimen, from the deforested Sabei region, is typical *capense*. I regard *L. c. ornatum* as a forest form with headquarters in the high country of the Central Lake region much of which has undergone deforestation within living memory. Both forms meet at Ujiji.

My reasons for regarding *ornatum* as a race of *capense*, rather than a full species, is on account of the spotted snake from Bugoye, eastern slopes of Ruwenzori, which has the first labial and post nasal *meeting* in a point, as have also occasional *capense* from Gulu, Acholi, and elsewhere.

Variation. The uniformity exhibited by this extensive series is remarkable, leaving little to add to the exhaustive description furnished by Parker.

Midbody scale-rows 17; ventrals 180–205; anal entire; subcaudals 34–49; labials 8, the first separated from the postnasal except for the Bugoye snake, the third, fourth and fifth entering the orbit, or very rarely 7 labials, the third and fourth entering the orbit (2 ex.); 4 or 5 lower labials in contact with an anterior sublingual; loreal 1; preocular 1; postoculars 2; temporals 1 + 2, rarely 1 + 1 (1 ex.) or 2 + 2 (4 ex.).

Measurements. Largest ♂ (M. C. Z. 48196) measures 405 (346 + 59) mm.; largest ♀ (M. C. Z. 48235) measures 475 (406 + 69) mm.

Sexual dimorphism. Unfortunately there is a slight overlap in the number of subcaudals, viz.

23 ♂ ♂ range from 180–198 ventrals and 41–49 subcaudals,
37 ♀ ♀ range from 188–205 ventrals and 34–43 subcaudals.

Breeding. At Mushongero, on February 2, a batch of 5 eggs measuring 21 x 15 mm. containing well advanced embryos, were found in a termitarium (*fide* native). They hatched on Idjwi Island on March 6, at which time one of the hatchlings (M. C. Z. 48192) measured 145 (125 + 20) mm. The rest were released.

On Idjwi Id.,	February	21,	a ♀ held	4	eggs	measuring	9 x 5 mm.
"	"	22	"	4	"	"	9 x 5 mm.
"	"	22	"	4	"	"	14 x 6 mm.
"	"	22	"	2[1]	"	"	20 x 9 mm.
"	"	25	"	3	"	"	10 x 5 mm.
"	"	25	"	5	"	"	12 x 6 mm.
"	"	28	"	3	"	"	26 x 10 mm.
"	"	28	"	3	"	"	10 x 5 mm.

Diet. A lizard (*Algiroides boulengeri*) in one, a skink (*Mabuya m. maculilabris*) in another, and 22 skinks (*Lygosoma blochmanni*) in almost as many other snakes, showing that this little skink constitutes the principal food of *L. c. ornatum* on Idjwi Island.

Habitat. I caught this species on paths right in the forest and its

[1] Probably one or more eggs had been laid already.

prey are principally found on the sunny banks at the sides of such paths. There is little or no forest, however, in the Uganda and Tanganyika localities whence single specimens were taken.

LYCOPHIDION CAPENSE CAPENSE (Smith)

Lycodon capense A. Smith, 1831, S. Afr. Quart. Journ., **1**, p. 18: Kurrichane, *i.e.* Rustenberg district, Transvaal.

•1 (M. C. Z. 48251) Butiaba, U. 5.xii.38.
2 (M. C. Z. 48252–3) Ujiji, T. T. 10.iii.39.
1 (M. C. Z. 48254) Mikindani, T. T. 18.iv.39.
7 (M. C. Z. 48255–9) Mbanja, T. T. 26–30.iv.39.
4 (M. C. Z. 48260–3) Nchingidi, T. T. 18.v.39.
2 (M. C. Z. 48264–5) Amboni Est., T. T. 24.vi.39.
1 (M. C. Z. 48266) Opp. Kilindini, K. C. 25.vii.39.

Native names. Namaluto (Kimakonde at Mikindani); *lukunguviro* (Kimakonde at Mbanja).

Variation. Midbody scale-rows 17; ventrals 184–211; anal entire; subcaudals 37–57; upper labials 8, the first in contact with the postnasal except on one side of an Mbanja snake, the third, fourth and fifth entering the orbit; postoculars 2, except on right side of M. C. Z. 48252; temporals 2 + 2 or 1 + 1 (M. C. Z. 48265 only).

Coloration. Agree with the typical form in having the throat more or less white, except for the Ujiji snakes which are dark, agreeing in this respect with the Zanzibar race *acutirostris!*

Measurements. Largest ♂ (M. C. Z. 48264) measures 408 (345 + 63) mm.; largest ♀ (M. C. Z. 48252) measures 467 (425 + 42) mm.

Sexual dimorphism. Subcaudal range in 9 ♂ ♂ is 46–57, in 8 ♀ ♀ it is 37–41.

Breeding.

At Mbanja,	April 26,	a ♀	held 5	eggs	measuring	24 x 10 mm.
"	" 28,	"	5	"	"	10 x 4 mm.
"	" 30,	"	4	"	"	10 x 4 mm.
"	" 30,	"	4	"	"	23 x 8 mm.

The last mentioned snake was sloughing and paired with a male which was so entrapped in the slough that it could not free itself! At Nchingidi, May 18, a very young snake, measuring only 182 (160 + 22) mm. was taken.

Diet. Young lizards (*Gerrhosaurus n. nigrolineatus*) in Mikindani and Amboni snakes; adult skinks (*Mabuya maculilabris*) in Amboni and Gulu, Acholi (Pitman coll.) reptiles; an adult *M. striata* in the largest

Ujiji female, *M. v. varia* in Mbanja and Nchingidi snakes and an *Ablepharus wahlbergii* in a very young Mbanja specimen.

Habitat. Under palm fronds or garden refuse at Butiaba, Mikindani and opposite Kilindini.

LYCOPHIDION CAPENSE >< ACUTIROSTRE Günther

Lycophidion intermediates between *capense* and *acutirostre* Loveridge, 1933, Bull. Mus. Comp. Zoöl., **74**, p. 234: Zanzibar and Bagamoyo, Morogoro and Kilosa in Tanganyika Territory.

3 (Vienna Mus.) Ugano, T. T. 1935 (H. Zerny).
juv. ♀ (M. C. Z. 48271) Mbanja, T. T. 27.iv.39.

Distribution. I have included some recently examined Zerny matetial as these two localities in extreme southern and southeastern Tanganyika Territory constitute the most southerly records of this form. Moreover typical *L. c. capense* occurs in both these localities!

Native name. *Lukunguriro* (Kimakonde at Mbanja for both forms).

Variation. Midbody scale-rows 17; ventrals 161–172; anal entire; subcaudals 23–37; labials 8, the first in contact with the posterior nasal, the third, fourth and fifth entering the orbit. Agreeing in their low ventral and subcaudal counts and black throat with this race as defined in the citation given above.

Measurements. The juvenile ♀ measures 151 (137 + 14) mm.

Diet. A skink (*Ablepharus wahlbergii*) in this tiny snake.

[MEHELYA CAPENSIS CAPENSIS (Smith)]

Heterolepis capensis A. Smith, 1847, Ill. Zool. S. Africa, Rept., pl. lv: Eastern parts of Cape Province, South Africa.

Distribution. When writing the revision of this genus, I (1939c, p. 144) was surprised at the absence of records of this race between the Usambara Mountains in Tanganyika and Delagoa Bay in Mozambique. At Lindi I met Dr. L. Stirling of the Universities Mission who described this snake to me beyond the shadow of a doubt as occurring southwest of Lindi at Lulindi, where there is a remnant of forest. He encountered one in the church at 7 p.m. while another was killed in the bed of a native child. The latter, a boy aged 12, felt something moving about his feet so got up. Both reptiles were large.

[Pseudaspis cana (Linnaeus)]

Coluber canus Linnaeus, 1758, Syst. Nat., ed. 10, **1**, p. 221: "Indiis."

Breeding. On South Kinangop, Kenya Colony, Mrs. Nightingale Jr. asked me the name of a large four-foot olive snake, which had thirty live chequered young in its oviducts, that they had killed.

Chlorophis carinatus Andersson

Chlorophis carinatus Andersson, 1901, Svenska Vetensk.-Akad. Hand., **27**, No. 5, p. 9: Cameroon.

1 (M. C. Z. 48275) Budongo Forest, U. 29.xi.38.
2 (M. C. Z. 48276) Idjwi Island, B. C. 22.ii.39.

Native name. Lushangabanyeri (Lulega).

Variation. Midbody scale-rows 13; ventrals 141–158; anal entire; subcaudals 76–86; labials 9, the fourth, fifth and sixth entering the orbit; temporals 2 + 2, rarely 2 + 1.

Coloration. ♂ (M. C. Z. 48276) Above, dark olive, head uniform, the vertebral series of scales edged baso-laterally with very pale blue, the outer scales on the outer baso-lateral side only also pale blue, tail uniform. Below, chin white, throat yellowish, rest of undersurface uniformly pale green.

Measurements. Large ♂ (M. C. Z. 48276) measures 556 (410 + 146) mm.

Chlorophis macrops (Boulenger)

Oligolepis macrops Boulenger, 1895, Ann. Mag. Nat. Hist. (6), **16**, p. 171: Usambara Mountains, Tanganyika Territory.

3 ♀ ♀ (M. C. Z. 48272–4) Nchingidi, Rondo Plateau, T. T. 12.v.39.

Corrigenda. In Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 117, lines 7, 8, and 23, for ventrals 169 read 149, for subcaudals 122, read 112. The erroneous figures result from the inclusion of three specimens of *C. neglectus* in the extensive series of topotypic *macrops*.

Variation. Midbody scale-rows 13; ventrals 135–141; anal divided; subcaudals 69–84; labials 8, the fourth and fifth entering the orbit, or 9, the fifth and sixth entering (on left side of M. C. Z. 48273 only); temporals 1 + 1 or 1 + 2.

Coloration. The largest ♀ exhibited a very peculiar coloration for a member of this genus. Above, uniform brown except for a few scales which resemble the laterals in being edged with black. Below, white, each ventral with a dull blood-red blotch above the keel (*i.e.* laterally) and a less distinct smaller one below the keel (*i.e.* abdominally); tail dull white with each subcaudal faintly tinged with blood red basally.

Measurements. Largest ♀ (M. C. Z. 48272) measures 697 (525 + 172) mm.

Diet. A chameleon (*Brookesia brevicaudata*) in largest, tail of a skink, also a frog (*Arthroleptis s. lönnbergi*) in another.

CHLOROPHIS HOPLOGASTER (Günther)

Ahaetulla hoplogaster Günther, 1863, Ann. Mag. Nat. Hist. (3), **11**, p. 284: Port Natal, *i.e.* Durban, Natal.

♀ (M. C. Z. 48277) Mabira Forest, U. 12.xi.38.

Native name. Newandegala (Luganda).

Variation. Midbody scale-rows 15, ventrals without keels 157; anal divided; subcaudals 92; labials 8, the fourth and fifth entering the orbit; temporals 1 + 1.

Measurements. ♀ measures 880 (627 + 253) mm.

Breeding. Oviducts held six eggs measuring 30 x 10 mm.

Diet. A lizard (*Algiroides africanus*) in stomach.

CHLOROPHIS NEGLECTUS (Peters)

Philothamnus neglectus Peters, 1866, Monatsb. Akad. Wiss. Berlin, p. 890: Praso Boror, Mozambique.

2 (M. C. Z. 48301–2) Ujiji, T. T. 10.iii.39.
1 (M. C. Z. 48304) Kitaya, T. T. 24.iii.39.
2 (M. C. Z. 48305–6) Mikindani, T. T. 14.iv.39.
♂ (M. C. Z. 48307) Lake Rutamba, T. T. 8.v.39.
♂ (M. C. Z. 48308) Nchingidi, T. T. 14.v.39.
♂ (M. C. Z. 48309) Amboni Estate, T. T. 19.vi.39.
4 (M. C. Z. 48310–2) Magrotto Mtn., T. T. 1.vii.39.

Native names. Namalanga (Kimakonde); *nyoka amani* (Kisambara).

Variation. Midbody scale-rows 15; ventrals with lateral keels 146–152; anal divided; subcaudals 85–99; labials 8, the fourth and fifth

entering the orbit; preocular 1, rarely 2 (one side of one snake only); postoculars 2; temporals 1 + 1, rarely 1 + 2 or 2 + 3 (M. C. Z. 48305).

Coloration. A Mikindani snake was green above with seven short, dark, transverse bars on nape giving it somewhat the appearance of a *Causus resimus.* The young Rutamba snake was rich velvety green with a brown, transverse bar on nape followed by a series of nine, more or less paired, brown spots.

Measurements. Largest ♂ (M. C. Z. 48302) measures 657 + (462 + 185 +) mm., tail tip missing.

Diet. Frogs (*Arthroleptis s. stenodactylus*) in the Kitaya snakes.

Habitat. A young one in a heap of debris beneath a mango tree at Mikindani, another was taken near my tent at Kitaya, following heavy rain.

CHLOROPHIS IRREGULARIS (Leach)

Coluber irregularis Leach, 1819, in Bowdich, Miss. Ashantee, p. 494: Ashanti, Gold Coast.

1 (M. C. Z. 47880) Mabira Forest, U. 8.xi.38.
4 (M. C. Z. 48278–80) Bundibugyo, U. 21–24.xii.38.
3 (M. C. Z. 48281–3) Mihunga, U. 16.i.39.
Eggs 13 (M. C. Z. 48285–95) Mushongero, U. 1–4.ii.39.
2 (M. C. Z. 48296) Kisenyi, B. R. 10.ii.39.
6 (M. C. Z. 48297–9) Idjwi Id., B. C. 16–28.ii.39.

Native names. Newandagala (Luganda); *salalu* (Luamba); *nyarubabi* or *nyaruteti* (Lutoro); *chienzi* (Lukonjo); *muchenganyi* (Lukiga); *lushangabanyeri* (Lulega).

Variation. Midbody scale-rows 15; ventrals 154–167; anal divided; subcaudals 92–117; labials 9, rarely 8, the fourth, fifth and sixth or fifth and sixth (M. C. Z. 48298 left side only) entering the orbit; temporals 1 + 1 (on 43 sides) or 1 + 2 (on 15 sides).

Measurements. Largest ♂ (Idjwi Id.) measures 845 (575 + 270) mm.; largest ♀ (M. C. Z. 48278) measures 1058 (735 + 323) mm.

Breeding.

Bundibugyo,	December 21,	a ♀ held	5 eggs measuring	22 x 7 mm.
Mihunga,	January 16,	"	5 "	32 x 11 & 28 x 12 mm.
Kisenyi,	February 10,	"	8 "	25 x 10 mm.

In addition, at Mushongero, on February 1, a native brought me 193 eggs which he allegedly dug from two termitaria. One batch of 8 eggs measuring 25 x 14 mm., another of 8 measured 39 x 17 mm., while

3 eggs selected from different batches measured 43 x 18 mm., 30 x 18 mm., and 29 x 18 mm. respectively, their diameter evidently conditioned by the girth of the parent; each contained an embryo nearly ready for hatching, such measuring 203 (143 + 60) mm., and on hatching a few weeks later a ♂ measured 260 (180 + 80) mm., and a ♀ measured 249 (180 + 69) mm.

Diet. A large lizard (*Lacerta jacksoni*) two young toads (*Bufo regularis*) and three yellow sedge frogs (*Hyperolius schubotzi*) in three Idjwi Island snakes, a frog (*Rana fuscigula*) in a Mushongero snake.

Parasites. Nematodes (*Amphicaecum sp.* and *Ascaroidea sp.*) in an Idjwi Island snake.

Temperament. A snake, losing its hold on a palm frond overhanging a path in the public garden on the Lake shore at Kisenyi, fell at my feet. As I seized it, the snake gaped till its jaws were in almost a single plane as it struck, the teeth drew little blood.

Habitat. At Mihunga I captured several in a swamp where they were undoubtedly hunting frogs.

CHLOROPHIS HETEROLEPIDOTUS (Günther)

Ahaetulla heterolepidota Günther, 1863, Ann. Mag. Nat. Hist. (3), **11**, p. 286: Africa.

♀ (M. C. Z. 47809) Bukakata, U. 7.ix.38. (C.R.S.Pitman).
4 (M. C. Z. 47841–4) Lira, Lango, U. iv–viii.38. (C.R.S.P.).
♂ (M. C. Z. 48284) Nyakabande, Kigezi. U. 28.i.39.
♂ (M. C. Z. 48300) Kitaya, Ruvuma River. T. T. 24.iii.39.

Variation. Midbody scale-rows 15; ventrals 173–185; anal divided; subcaudals 107–124; labials 9, rarely 8 (M. C. Z. 47809 left side only), the fourth, fifth and sixth entering the orbit; temporals 1 + 1, rarely 1 + 2.

This snake, so apt to be confused with other members of the genus, is recognizable by its extremely slender form anteriorly and higher ventral count. The highest ventral count is for the Kitaya snake, the highest subcaudal for the Nyakabande reptile.

Measurements. Largest ♂ (M. C. Z. 48300) measures 730 (492 + 238) mm.; largest ♀ (M. C. Z. 47842) measures 586 (400 + 186) mm.

Diet. A sedge frog (*Hyperolius rossii*) in each of the two Lira males, a yellow frog (*Hyperolius sp.*) in the Nyakabande snake, a frog in the Kitaya specimen.

Philothamnus semivariegatus semivariegatus Smith

Philothamnus semivariegatus A. Smith, 1849, Ill. Zool. S. Africa, Rept., pls. lix, lx, lxiv: Bushman's Flats and Kurrichane, *i.e.* Rustenberg district, Transvaal.

1 (M. C. Z. 47820) Katwe, U. x.38. (C.R.S.Pitman).
1 (M. C. Z. 48313) Budongo Forest, U. 3.xii.38.
1 (M. C. Z. 48314) Bundibugyo, U. 22.xii.38.
1 (M. C. Z. 48315) Ujiji, T. T. 15.iii.39.
8 (M. C. Z. 48316–21) Kitaya, T. T. 25.iii.–3.iv.39.
6 (M. C. Z. 48322–5) Mikindani, T. T. 15–21.iv.39.
2 (M. C. Z. 48326–7) Mbanja, T. T. 1 & 5.v.39.
1 (M. C. Z. 48328) Siga Caves, T. T. 14.vi.39.
3 (M. C. Z. 48329–31) Amboni Est., T. T. 17.vi.39.
2 (M. C. Z. 48332–3) Magrotto Mtn., T. T. 3.vii.39.

Native names. Not distinguished from *C. irregularis* in Luamba and Lutoro; *kisumera* (Kimakonde at Kitaya); *namahamba* (Kimakonde at Mikindani and Mbanja); *nawirangira* (Kimawiha); *ngoe* (Kisambara, but supposed to be young of green mamba, *D. angusticeps*).

Variation. Midbody scale-rows 15; ventrals 164–193; anal divided; subcaudals 127–157; labials 8, the fourth and fifth entering orbit (3 odd sides), or 9, the fourth, fifth and sixth (23 sides), or 9, the fifth and sixth (22 sides), or 10, the fifth, sixth and seventh (3 sides), or 10, the sixth and seventh (1 side) entering orbit; temporals 2 + 2 (41 sides), or 2 + 1 (5 sides), or 1 + 2 (5 sides), or 1 + 1 (1 side).

Coloration. At Kitaya snakes with blue heads as well as with green heads were present, one of the latter had the anterior third of the body transversely barred with blue. At Mikindani most specimens were uniformly green, being distinguished from *Chlorophis neglectus* only by the subcaudal keel and scale-counts; one had a bluish head.

Measurements. Largest ♂ (M. C. Z. 48333) measures 1113 (690 + 423) mm., largest ♀ (Mikindani) measures 1162 (745 + 417) mm.

Sexual dimorphism. None in scalation, for the
10 ♂ ♂ range from 164–193 ventrals and 127–156 subcaudals, while
16 ♀ ♀ range from 167–192 ventrals and 128–157 subcaudals.

Breeding.

Budongo Forest,	December 3,	a ♀ held	4	eggs measuring	30 x 8 mm.
Kitaya,	March 25,	"	7	" "	21 x 7 mm.
"	April 3,	"	6	" "	11 x 3 mm.
Mikindani,	April 20	"	5	" "	28 x 8 mm.
"	April 21	"	3	" "	29 x 8 mm.
Mbanja	May 1,	"	5	" "	20 x 5 mm.
"	May 5,	"	5	" "	24 x 6.5 mm.

Diet. Geckos (*Lygodactylus p. gutturalis*) in the Katwe and Budongo snakes, *L. g. grotei* in Ujiji, Mikindani and Mbanja specimens, *Hemidactylus mabouia* in Kitaya and Mbanja reptiles; three young tree frogs (*Leptopelis concolor* in a Siga snake, *Megalixalus brachycnemis* in one from Kitaya, *Hyperolius parkeri* in a juvenile which I captured in sedges growing from knee-deep water in an Amboni swamp.

Parasites. Nematodes (*Thubunaea sp.*, probably *T. asymmetrica*) and immature cestodes in a Mikindani snake.

Habitat. I shot a female with truncated tail as it was basking about a knot hole of an almost vertical tree trunk at Kitaya.

GASTROPYXIS SMARAGDINA (Schlegel)

Dendrophis smaragdina Schlegel, 1837, Essai Phys. Serp., **2**, p. 237: Gold Coast.

♀ (M. C. Z. 48334) Bundibugyo, U. 22.xii.38.

Native names. Not distinguished from *Chlorophis irregularis* in Luamba and Lutoro.

Variation. Midbody scale-rows 15; ventrals 160; anal divided; subcaudals 144; labials 9, the fifth and sixth entering orbit; postoculars 2–3; temporals 1 + 2.

Measurements. ♀ measures 1143 (715 + 428) mm.

Breeding. Oviducts held 4 eggs measuring 23 x 7 mm.

HAPSIDOPHRYS LINEATA Fischer

Plate 2, fig. 3.

Hapsidophrys lineata Fischer, 1856, Abhand. Nat. Ver. Hamburg, **3**, p. 111, pl. ii, fig. 5: Elmine, Gold Coast.

♂ (M. C. Z. 48335) Budongo Forest, U. 22.xi.38.
♀ (M. C. Z. 48336) Kibale Forest, U. 14.xii.38.

Variation. Midbody scale-rows 15; ventrals 159–161; anal entire; subcaudals M and 104; labials 8, the fourth and fifth entering orbit; postoculars 2–3; temporals 2 + 2.

Coloration. ♀. Above, rich velvety green, each scale heavily edged with black forming ten black lines on dorsum converging to form five broad ones on tail. Below, a paler, slightly yellowish, green, the lateral keels and edges of the ventrals darker, almost bluish, a median black line along tail.

Measurements. ♂ measures 985^{+} ($760 + 225^{+}$) mm., tail tip missing; ♀ measures 983 (705 + 278) mm.

Breeding. ♀ held 2 eggs measuring 25 x 6 mm.

Diet. A frog (*Phrynobatrachus dendrobates*) in stomach of male, frog's bones in that of female.

Temperament. The female was moving slowly along a branch of a sapling in deep forest. It was only five feet from the ground and as I took it by the neck it made no attempt to bite, nor later when subjected to considerable provocation during a quarter-of-an-hour's posing for its photograph.

RHAMNOPHIS AETHIOPISSA ELGONENSIS Loveridge

Rhamnophis aethiopissa elgonensis Loveridge, 1929, Bull. U. S. Nat. Mus. **151,** p. 24: Yala River nr. Kaimosi, Kakamega, Kenya Colony.

♂ (M. C. Z. 48343) Mabira Forest, U. 11.xi.38.
♂ (M. C. Z. 48344) Kibale Forest, U. 17.xii.38.

Synonymy and a correction. All the Uganda material referred to *ituriensis* by Pitman (1936–1938) are really *elgonensis,* this also applies to his fine colored plate. To avoid further confusion of the forms the following key, based on all records in the literature and a detailed examination of M. C. Z. material, is given.

1. Midbody scale-rows 13; anal entire; subcaudals less than 116; maxillary teeth 30 + 3 to 35 + 3. *batesii*
   Midbody scale-rows 15–19; anal divided; subcaudals more than 116; maxillary teeth 17 + 3 to 20 + 3. 2
2. Midbody scale-rows 17, very rarely 15, 16, or 19; lower postocular in contact with 3 upper labials; range: French Guinea east to the western Belgian Congo. . . . . *a. aethiopissa*
   Midbody scale-rows 15, very rarely 17; lower postocular in contact with 2 or 3 upper labials; range: eastern Belgian Congo to western Kenya Colony. 3
3. Subcaudals 134–150; normally upper labials 8, sometimes 7; range: Ituri region of eastern Belgian Congo. . . . . *a. ituriensis*
   Subcaudals 117–138; normally upper labials 7, sometimes 6 or 8; range: western Uganda to western Kenya Colony. . . *a. elgonensis*

Taxonomically *batesii*, which ranges from Cameroon to the eastern Belgian Congo, appears to be nearly related to *a. elgonensis,* thus paralleling to some extent the situation in the allied genus *Thrasops* where the extreme westerly and easterly forms are more nearly related than the (?) derived forms occupying the Cameroon-Congo region.

The type number of *a. elgonensis* is M. C. Z. 18198, *not* 18189 as printed.

Variation. Midbody scale-rows 15; ventrals 156–158; anal divided; subcaudals 126–128; labials 7, the fourth and fifth entering the orbit.

Coloration. In life. ♂. Above, leaf green, each scale heavily edged with black, the black interstitial skin also conspicuous; upper labials pale green anteriorly and yellow posteriorly in their upper portion, blue below; five black lines on tail. Below, ventrals greenish flecked with white, a brown line along each lateral angle, outer ends of ventrals pale olive green; tail with a median dusky line flanked by irregular dark flecks.

Thrasops jacksonii jacksonii Günther

Thrasops jacksonii Günther, 1895, Ann. Mag. Nat. Hist. (**6**), **15**, p. 528: Kavirondo, Kenya Colony.

♀ (M. C. Z. 48341) Bundibugyo, U. 22.xii.38.
♂ ♀ (M. C. Z. 48342) Idjwi Id., B. C. 22.ii.39.

Native name. Wahimbiri (Lutoro and Luamba).

Synonymy. The snake from Mozambique described as *Thrasops j. mossambicus* by Mertens (1937b, Abh. Senckenberg. Naturf. Ges., No. 435, p. 13) is a *Dispholidus typus*, a correction with which Dr. Mertens concurs after reëxamination of the dentition. Parker (1940a, p. 271), by describing *occidentalis*, has elucidated the confusion arising from western records of *jacksonii.* The following key, based on all records in the literature, and a detailed study of M. C. Z. material, deals with the recognizable forms in the genus.

1. Three labials in contact with the lowest postocular; midbody scale-rows 15–19; ventrals 175–187; subcaudals 120–140; range: French Guinea east to Togo . . . . *occidentalis*
   Two, very rarely 3, labials in contact with the lowest postocular; range: Nigeria east to Kenya 2
2. Midbody scale-rows 13–15; the dorsals much longer than the ventrals; range: Nigeria south to Cabinda and western Belgian Congo . . . . *flavigularis*
   Midbody scale-rows 17–21, the dorsals not or but slightly longer than the ventrals; range: central Belgian Congo east to Kenya Colony 3
3. Midbody scale-rows 19, rarely 17 or 21; ventrals 187–211; range: central Belgian Congo east to western Tanganyika Territory and western Kenya Colony . . . . *j. jacksoni*
   Midbody scale-rows 17; ventrals 170–178; range: Mount Kenya to Nairobi in southcentral Kenya Colony . . . . *j. schmidti*

Variation. Midbody scale-rows 19; ventrals 187–206; anal divided; subcaudals 133–141; preoculars 1–2; postoculars 3. The young Idjwi male would actually fall to *occidentalis* in the above key for it has a third labial just reaching the lowest postocular.

Diet. A chameleon (*C. b. ellioti*) in the Bundibugyo snake; an agama (*A. atricollis*) in each of the reptiles from Upper Mulinga, Idjwi Island, Lake Kivu.

Meizodon semiornata (Peters)

Coronella semiornata Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 622: Tete, Mozambique.

1 (M. C. Z. 48337) Kitaya, Ruvuma R., T. T. 29.iii.39.
3 (M. C. Z. 48338–40) Amboni Estate, T. T. 19.vi.39.

Native name. *Namedi* (Kimakonde).

Variation. Midbody scale-rows 21; ventrals 175–196; anal divided; subcaudals 83–85; labials 8, the fourth and fifth entering the orbit; 4–5 lower labials in contact with an anterior sublingual; preocular 1; postoculars 1–2; temporals 2 + 2, rarely 2 + 3 or 3 + 3 (M. C. Z. 48338).

Corrigenda. Having examined the type of *Coluber smithii* Boulenger from Somaliland, I must refer the Kenya snakes which I described as *Coronella semiornata fuscorosea* to the synonymy of *smithii*, entirely concurring with the remarks of Bogert (1940, p. 48) who independently reached the same conclusion, and whom I follow in recognizing *Meizodon* for the tropical African '*Coronella*', so different from the European genotype, *austriaca*.

Measurements. Largest ♂ (M. C. Z. 48338) measures 695+ (550 + 145+) mm., tail tip missing; only ♀ (M. C. Z. 48339) measures 682 (552 + 130) mm.

Diet. A gecko (*Hemidactylus gardineri*) in one Amboni snake.

Habitat. I caught all beneath rotting vegetation, the Kitaya snake at the base of a banana plant, the others in a sisal plantation as described under Amboni in the account of the itinerary.

Meizodon coronata (Schlegel)

Calamaria coronata Schlegel, 1834, Phys. Serp., **2**, p. 46· Gold Coast.

♂ (M. C. Z. 47829) Gulu, Acholi, U. ix–x.38. (C.R.S. Pitman).

Variation. Midbody scale-rows 19; ventrals 185; anal divided; subcaudals 66+; labials 8, the fourth and fifth entering orbit; preocular 1; postoculars 2; temporals 1 + 2.

In its labial-sublingual arrangement of 4–5 in contact, this individual combines the characters of both *coronata* and its synonym *regularis* and possesses the blackish belly of the latter. For discussion on this subject see Loveridge (1936j, p. 253).

Measurements. ♂ measures 597^+ ($482 + 115^+$) mm., tail tip missing.

GRAYIA SMYTHII (Leach)

Coluber Smythii Leach, 1818, in Tuckey, Explor. River Zaire, App., p. 409: Embomma, *i.e.* Boma, Belgian Congo.

♂ ♀ (M. C. Z. 47813–4) Mlanji, L. Victoria, U. 14–20.vii.38. (C.R.S. Pitman).

Variation. Midbody scale-rows 17; ventrals 155–164; anal 2; subcaudals 92-99; labials 7-8, the fourth entering the orbit; temporals 2 + 2 and 2 + 3.

Measurements. ♂ measures 990 (675 + 315) mm.; the ♀ measures 1260 (900 + 360) mm.

DUBERRIA LUTRIX ABYSSINICA (Boulenger)

Homalosoma abyssinicum Boulenger, 1894, Cat. Snakes Brit. Mus., **2**, p. 276, pl. xiii, fig. 2: Lake Ashangi, Ethiopia.

2 (M. C. Z. 48345) S. Kinangop, K. C. 27.x.38.
11 (M. C. Z. 48346–53) Nyakabande, U. 27–31.i.39.
1 (M. C. Z. 48354) Mushongero, U. 1.ii.39.

Native name. *Bulifu* (Lukiga).

Synonymy—a correction. In reporting on a collection of *D. l. shirana*, and with inadequate northern material, I (1933h, p. 241) assumed that the holotype of *abyssinica* without a loreal, and holotype of *atriventris* with a loreal, were simply aberrations of the highly variable *shirana*.

Uthmoller (1937, Temminckia, **2**, p. 112), reporting on three specimens from the Kilimanjaro region, remarked that all three were likewise intermediate in character between *shirana* and *lutrix*.

Pitman (1936, p. 62) commented on Kigezi snakes being much nearer *abyssinica* than to *shirana* in the matter of colouration.

More recently, Bogert (1940, p. 40) revived the name *abyssinica* in a racial sense for an Ethiopian specimen, pointing out that its ventral and subcaudal counts were lower than that of females in my series of *shirana* from southern Tanganyika Territory.

After going through the entire *Duberria* literature, I find that I was in error in not recognizing *abyssinica*, to whose synonymy *atriventris* (Sternfeld) should be transferred as all attempts to separate them failed. The following key, based on counts of 53, 50 and 56 snakes respectively, though not all the characters have been available in every specimen, reflect the position as it stands at present. Slight changes in the percentages are due to the effect of additional data. I regard *D. l. abyssinica* of the Northern highlands as being the original stock giving rise to both *shirana* and *lutrix* between which it occupies an intermediate position.

1 postocular (100%); a loreal (absent in 10%); belly usually very dark' rarely yellowish in middle; range: highlands of western Belgian Congo northeast through Uganda, Ethiopia and south to the Usambara Mountains in northeastern Tanganyika Territory . . . . *l. abyssinica*
1 postocular (85%, 2 in 15%); no loreal (100%); belly yellowish in middle, rarely dark; range: highlands of southern Tanganyika and Nyasaland around L. Nyasa . . . . *l. shirana*
2 postoculars (87%, 1 in 13%); a loreal (absent in 7%); belly yellowish in middle; range: highlands and lowlands of Africa south of the Zambesi . . . . *l. lutrix*

The lepidosis of the three forms, based on all available records and scale-counts of the new material listed above, is as follows:

D. l. abyssinica.	Range of ventrals	118–149,	subcaudals	17–39.
D. l. shirana	"	126–151,	"	24–46.
D. l. lutrix	"	120–134[1],	"	[2]25–51.

Omitted from *abyssinica* is Pitman's (1938b, p. 117) record of 151 ventrals and 46 subcaudals, as the latter is so much higher than any other Kigezi specimens and may be based on a native's count.

Measurements. Largest ♂ (M. C. Z. 48354) measures 332 (281 + 51) mm.; largest ♀ (M. C. Z. 48346) measures 369 (332 + 37) mm.

Pitman (1936, p. 62) is mistaken in thinking that Sternfeld's measurements refer to the Bukoba snake. Throughout his papers on the Fauna der deutschen Kolonien, Sternfeld furnishes condensed translations of Boulenger's descriptions, renders millimetres into centimetres, then adds such localities as Bukoba from which he has material. The 390 mm. snake, whose large size surprised Pitman, was a typical *lutrix lutrix* from South Africa.

[1] 144 *fide* Boulenger.
[2] 21 *fide* Boulenger.

Breeding. The following records of developing eggs were made. Nyakabande:

January 27, 1939, a	♀	held uncounted eggs with large embryos.				
"	♀	"	11 eggs measuring 14 x 7 mm.			
"	♀	"	10	"	"	8 x 5 mm.
"	♀	"	7	"	"	12 x 9 mm.

Diet. Slugs were present in the stomachs of four Nyakabande snakes.

DUBERRIA LUTRIX SHIRANA (Boulenger)

Homalosoma shiranum Boulenger, 1894, Cat. Snakes Brit. Mus., **2**, p. 276. pl. xiii, fig. 1: Shire Highlands, Nyasaland.

7 (M. C. Z. 44114 & Vienna Mus.) Ugano, T. T. 1935–6. (H. Zerny).

Distribution. Ugano is in the Matengo highlands just east of Lake Nyasa at about 1400–1600 metres. As these snakes constitute the third known series of the race, their data is furnished below. All other references, other than mine (1933h, p. 241) and part of Bogert's (1940, p. 39) should be transferred to *abyssinica*, except of course those based on the type.

Variation. Midbody scale-rows 15; ventrals 132–148; anal entire; subcaudals 29–41; labials 6, the third and fourth (9 sides) or second, third and fourth (4 sides) entering orbit, or 7, the third, fourth and fifth entering (1 side); loreal absent; preocular 1; postocular 1; temporals 1 + 2.

Measurements. Largest, a ♀ (M. C. Z. 44114), measures 379 (326 + 53) mm.

PROSYMNA AMBIGUA STUHLMANNI (Pfeffer)

Liginirostra stuhlmanni Pfeffer, 1893, Jahrb. Hamburg. Wiss. Anst., **10**. p. 78, pl. i, figs. 8–10: Usambara, Tanganyika Territory.

♂ ♂ (M. C. Z. 48355–6) Amboni Estate, T. T. 19.vi.39.

Variation. Midbody scale-rows 15; ventrals 127–129; anal entire; subcaudals 29–28; labials 6, the third and fourth entering the orbit; preocular 1; postoculars 2; temporals 1 + 2.

Coloration. One is white beneath, the other black.

Measurements. Both ♂♂ measuring the same, *viz.* 189 (161 + 28) mm.

Habitat. Ploughed up by tractor in sisal plantation.

DASYPELTIS SCABER MEDICI (Bianconi)

Dipsas medici Bianconi, 1859, Mem. Accad. Sci. Bologna, **10**, p. 501, pl. xxvi: Mozambique.

Dasypeltis scaber var. *fasciolata* Peters, 1868, Monatsb. Akad. Wiss. Berlin, p. 451: Zanzibar.

Dasypeltis lineolatus Peters, 1878, Monatsb. Akad. Wiss. Berlin, p. 206: Kitui, Ukamba, Kenya Colony.

Dasypeltis elongata Mocquard, 1888, Mem. Cent. Soc. Philom. Paris, p. 131, pl. xii, fig. 2: Zanzibar.

Dasypeltis scabra var. *bianconii* Med. (*sic*) Boettger, 1893, Zool. Anz., p. 387: (*lapsus* for var. *medici* Bianconi).

♀ (M. C. Z. 48384) Mikindani, T. T. 21.iv.39.
♂. 4 ♀ (M. C. Z. 48385–9) Nchingidi, T. T. 18.v.39.

Native name. *Kwararu* (Kisambara).

Variation. Midbody scale-rows 23–25; ventrals 242–249; anal entire; subcaudals 73–86; preoculars 1–2; postoculars 2.

Measurements. ♀ (M. C. Z 48384) measures 750 (625 + 125) mm.

Breeding. At Mikindani, April 21, above ♀ held 6 eggs measuring 24 x 8 mm. All the Nchingidi specimens were young, four were under 268 mm. in total length and appeared to be from the same litter, two being taken in my tent and two under a nearby log at the forest-edge.

Remarks. Some remarks appear called for by my action in reviving the name *medici*. I had already been puzzled by, and commented upon, the high ventral and subcaudal counts of certain East African '*scaber*,' but the position was masked in part by non-separation of the sexes, and further confused by the occurrence in West Africa of snakes with a similarly high range of scale-counts, though those occupying the centre of the continent have the low counts usually associated with typical *scaber*. A somewhat analogous position occurs with the forms of the genus *Thrasops* in the sense that the eastern and western forms are more closely related than those now occupying the central part of the range.

Bogert (1940, p. 86) has recently clarified the position regarding the status of the western virgin-forest form *macrops*, now made a synonym of *fasciatus*, by advancing sound reasons for treating it as a race of *scaber*. Its not altogether unexpected discovery in western Uganda has caused me to attempt an elucidation of the status of the various races occurring in East Africa. I had been long aware that in

the montane forests of this region only a uniformly black, brown, or pinkish brown form (*palmarum*) occurred, which form I now find occupies the highland plateau of the Central Lake region also. In general throughout this region the rhomboid form appears to be found along rivers and in the steppe and savanna. Whether it can be recognized as an ecological form separable from *palmarum* only by colour — for the squamation is the same — remains to be seen.

D. s. medici is an eastern coastal-belt, or coastal-plain, race associated with red laterite soils which are characteristic of this region. It ascends up to 3,000 feet (Amani, Usambara mountains, and Nchingidi, Rondo Plateau) where the red soils are to be found. The form itself, is reddish, uniform, or more usually cross-striped with narrow black striae.

At some not too distant date I hope to study the entire literature of *Dasypeltis*, but in the meantime offer the following tentative key based on nearly a hundred specimens in the collection of the Museum of Comparative Zoölogy. It is not to be expected that every individual reptile will confine its movements to its allocated sphere; in general, however, the arrangement appears to reflect the position very closely, and such apparent contradictions as have been investigated proved to have erroneous data or to be incorrectly sexed. I regard the South African *inornatus* (inc. *unicolor*) as a recognizable southeastern race distinguished from *scaber scaber* by its high subcaudal count and colour, the latter leading to its confusion with *palmarum*.

Ecological Races of DASYPELTIS *occurring in East and Central Africa*

1. Subcaudals of males more than 77 (78–94), of females more than 62 (63–87) . . . . 2.
   Subcaudals of males less than 75 (51–74), of females less than 66 (44–65) . . . . 3.
2. Above pinkish brown, uniform in northeast, usually with numerous, narrow, dark, sometimes light-edged, crossbands, ∩-shaped anteriorly, posteriorly transverse and coalescing on dorsum with a more or less distinct vertebral band (On reddish laterite soil of coastal plain up to 3,000 feet, from Somaliland to Mozambique) . . . . *s. medici*
   Above yellowish olive to pinkish brown, with numerous, broad, dark, vertical, stripes on flanks which may alternate, or coalesce, with blotches on dorsum (Virgin forests of West Africa from Sierra Leone to extreme western border of Uganda) . . *s. fasciatus*

3. Above pinkish brown, dark brown, or black, uniform, except near range of *fasciatus* when there may be some transverse dark lines anteriorly (Highlands of Central African Lake Region, in East in montane forests of Elgon, Kenya and Kilimanjaro, possibly Ethiopian form distinct; transAfrica in equatorial region) *s. palmarum*

   Above pale sandy or olive brown, with numerous, dark, stripes or blotches on flanks alternating with a dorsal series of large rhomboidal or squarish spots which sometimes coalesce to form a zigzag vertebral band (Savanna areas and river banks in Uganda, Kenya and Tanganyika; ranging from Sudan to Cape) .*s. scaber*

Dasypeltis scaber fasciatus Smith

Dasypeltis fasciatus A. Smith, 1842, Illus. Zool. S. Africa, **3**, footnote to pl. lxxiii: Sierra Leone.

Dipsas carinatus Hallowell, 1845, Proc. Acad. Nat. Sci. Philadelphia, p. 119: Africa, later given as Liberia.

Rachiodon scaber var. *subfasciatus* Jan (*nomen nudum*), 1863, Elenco Sist. Degli Ofidi, p. 106: Gold Coast.

Dasypeltis macrops Boulenger, 1907, Ann. Mag. Nat. Hist. (7), **19**, p. 324: Efulen, French Cameroon.

4 ♀ ♀ (M. C. Z. 48357–8) Bundibugyo, U. 21.xii.38.

Distribution. Bundibugyo lies northwest of the Ruwenzori Mountains, *i.e.* is in the Ituri Forest region and probably is the only area of Uganda where this western forest form (of which *macrops* is a syn.) occurs. These specimens constitute the first Uganda records.

Native name. Bankei (Luamba).

Variation. Midbody scale-rows 21–25; ventrals 239–248; anal entire; subcaudals 63–69; preoculars 1–2; postoculars 2.

This form is sharply distinguished from *palmarum* and *scaber* by its higher ventral and subcaudal count, but I cannot find the larger eye a character constant enough to be of value. It will be recalled that *breviceps* Peters from southeast Africa was separated from *scaber* on the same basis. Large eyed individuals, or groups of such, appear to crop up throughout the range of this widespread species.

Measurements. Largest ♀ (M. C. Z 48358) measures 862 (730 + 132) mm.

Breeding. One ♀ held small ova, another 9 eggs measuring 16 x 6 mm., a third 5 eggs, each measuring about 43 x 10 mm.

Dasypeltis scaber palmarum (Leach)

Coluber Palmarum Leach, 1818, in Tuckey, Explor. River Zaire, App. p. 408: Embomma, *i.e.* Boma, Belgian Congo.

?*Rachiodon Abyssinus* Duméril & Bibron, 1854, Erpét. Gén., **7**, p. 496: Ethiopia.

Rachiodon scaber var. *unicolor* Jan, part (*nomen nudum*), 1863, Elenco Sist. Degli Ofidi, p. 106: Gold Coast.

Dasypeltis scabra var. *atra* Sternfeld, 1912, Wiss. Ergeb. Deut. Zentral-Afrika-Exped. 1907–1908, **4**, p. 272: Virgin forest behind boundary mountains northwest shore of Lake Tanganyika, Belgian Congo.

♀ (M. C. Z. 48359) Mihunga, U. 29.xii.38.
♂, 3 ♀ ♀ (M. C. Z. 48360–1) Nyakabande, U. 28.i.39.
♂ ♀ (M. C. Z. 48362–3) Mushongero, U. 1.ii.39.
♀ (M. C. Z. 48364) Kisenyi, B. R. 10.ii.39.
16 ♂ ♂, 9 ♀ ♀ (M. C. Z. 48365–83) Idjwi Id., B. C. ii.39.

Native names. *Utugu* (Lulega, for black examples), *kubajoka* (Lulega, pinkish brown specimens).

Variation. Midbody scale-rows 21–25; ventrals 203–236; anal entire; subcaudals 51–73; preoculars 1–2; postoculars 1–2.

Coloration. Both uniformly black, brown, and pinkish red forms occur at upper Mulinga on Idjwi Island, Lake Kivu. Two ♂ ♂ (M. C. Z. 48374–5) tend towards the colouring of *fasciata* and it was interesting to note that these two snakes were the only ones with a subcaudal count above 69. The coloration in life of one unusual ♂ was noted as follows:

Above, dull copper, red, inverted, chevron-shaped markings on occiput, a chain of spots along vertebral line corresponding to a series of vertical stripes on flanks; flanks light coppery hue. Below, chin and throat white, rest of undersurface uniformly pink.

Measurements. Largest ♂ (M. C. Z. 48374) measures 623 (513 + 110) mm., largest ♀ (M. C. Z. 48360) measures 775 (677 + 98) mm.

Breeding. Not one was gravid.

Enemies. Three egg-eaters were recovered from the stomachs of cobras (*Naja melanoleuca*) on Idjwi Island.

Dasypeltis scaber scaber (Linnaeus)

Coluber scaber Linnaeus, 1758, Syst. Nat., ed. 10, **1**, p. 223: Indiis.

Anodon typus A. Smith, 1829, Zool. Journ., **4**, p. 443: Near Cape Town, Cape Province, Union of South Africa.

Dasypeltis scaber var. *capensis* Peters, 1864, Monatsb. Akad. Wiss. Berlin, p. 644, footnote: Cape of Good Hope.

Dasypeltis scaber var. *mossambicus* Peters, 1864, Monatsb. Akad. Wiss. Berlin, p. 644, footnote: Boror and Tete, Mozambique.

Dasypeltis scaber var. *breviceps* Peters, 1864, Monatsb. Akad. Wiss. Berlin, p. 645, footnote: Kaffirland.

♂ (M. C. Z. 47815) Busingiro, U. vii.38. (C.R.S.Pitman).

Variation. Midbody scale-rows 27; ventrals 196; anal entire; subcaudals 54; preocular 1; postoculars 2.

Geodipsas vauerocegae Tornier

Geodipsas vauerocegae Tornier, 1902, Zool. Anz., **25**, p. 703: Usambara Mountains, Tanganyika Territory.

♂ ♀ (M. C. Z. 48390–1) Magrotto Mtn., T. T. 8.vii.39.

Affinities. Bogert's (1940, p. 38) action in placing *Geodipsas* in juxtaposition to the aglyphous *Neusterophis* appears thoroughly sound. In external appearance, in the forest, I have often had a certain amount of difficulty in distinguishing *vauerocegae* from *N. olivaceus uluguruensis.* Until the relationships of all the aglyphous and opisthoglyphous genera of colubrines have been settled, however, I prefer to adhere to the older grouping for convenience of reference.

Variation. Midbody scale-rows 17; ventrals 128–131; anal entire; subcaudals 38 pairs in ♂, tail of ♀ lacks tip; labials 7, the third and fourth entering the orbit; preoculars 1; postoculars 2; temporals 1 + 2.

Measurements. The ♂, a juvenile evidently just born or hatched, measures only 125 (105 + 20) mm.

Habitat and *defense.* The adult was found among drift leaves between the buttress roots of a giant tree in the dark forest. Her eyes were opaque as if about to slough. On being picked up she emitted cloacal secretions which smelt just like those of *Natrix n. natrix.* The young male was in leaf mould beneath a nearby log. As I took it up by the middle it flattened out to the thinness of stout paper and held itself thus distended and rigidly immobile.

Boiga blandingii (Hallowell)

Dipsas Blandingii Hallowell, 1844, Proc. Acad. Nat. Sci. Philadelphia, p. 170: Liberia.

♀ (M. C. Z. 47812) Kome Id., Lake Victoria, U. 24.vi.38. (C.R.S.Pitman).

Distribution. Kome Island, near Entebbe, at the north end of the lake, should not be confused with the island of the same name near Mwanza, at the south end. The precise locality where the snake was killed is Kibanga, on Kome.

Variation. Midbody scale-rows 23; ventrals 255; anal entire; subcaudals 123; labials 9, the fourth, fifth and sixth entering the orbit; preoculars 1–2; postoculars 2; temporals 2 + 2.

Measurements. ♀ measures 1880 (1440 + 440) mm.

Boiga pulverulenta (Fischer)

Dipsas pulverulenta Fischer, 1856, Abhand. Natur. Ver. Hamburg, **3**, p. 81, pl. iii, figs. 1a–1c: Edina, Grand Bassa County, Liberia.

♀ (M. C. Z. 48392) Bundibugyo, U. 24.xii.38.

Distribution. The only other Uganda record for this species is that of Pitman (1938, p. 134) who took one in 1933 in the Mabira Forest.

Variation. Midbody scale-rows 19; ventrals 256; anal entire; subcaudals 118; labials 8, the third, fourth and fifth entering the orbit; preocular 1; postocular 2; temporals 2 + 2.

Measurements. ♀ measures 912 (720 + 192) mm.

Dipsadoboa unicolor Günther

Dipsadoboa unicolor Günther, 1858, Cat. Snakes Brit. Mus., p. 183: West Africa.

♂ (M. C. Z. 48394) Mabira Forest, U. 8.xi.38.
♂ (M. C. Z. 48395) Mihunga Swamp, U. 17.i.39.

Distribution. These snakes constitute the first records of this western forest form in Uganda.

Variation. Midbody scale-rows 17; ventrals 190–197; anal entire; subcaudals 57–66, single; labials 8–9, the fourth and fifth, or fourth-fifth and sixth entering the orbit; preocular 1; postoculars 2; temporals 1 + 2.

Coloration. In life. Above, bright olive green shading to plumbeous on tail. Below bright yellow on throat and ventrals, black beneath tail (♂ adult).

Above, soft olive green, becoming rather abruptly plumbeous on tail. Below, hinder part of throat white, ten anterior ventrals tinged with yellow, rest of under surface, including outer scale-row, uniformly blue. Vertical pupil is black, the iris a gray-greenish white. (♂ juvenile, its three umbilical ventrals still showing suture).

Measurements. Adult ♂ (M. C. Z. 48394) measures 853 (700 + 153) mm., the juvenile ♂ only 356 (303 + 53) mm.

Diet. A frog (*Phrynobatrachus graueri*) in stomach of juvenile.

Habitat. The young snake was taken on a tangle of vines growing on a wild banana in the swamp below Mihunga ridge, it did not make use of its tail when placed upon a twig.

CROTAPHOPELTIS HOTAMBOEIA HOTAMBOEIA (Laurenti)

Plate 3, fig. 1.

Coronella hotamboeia Laurenti, 1768, Syn. Rept., p. 85: "India orientali," *i.e.* Africa.

1 (M. C. Z. 47802) Lira, Lango, U. iv-viii.38 (C.R.S.Pitman).
1 (M. C. Z. 47811) Busiro, Kome Id., U. 17.vi.38 (C.R.S.Pitman).
1 (M. C. Z. 47816) Busingiro, Budongo F., U. vi.38 (C.R.S.Pitman).
1 (M. C. Z. 47831) Gulu, Acholi, U. iv-viii.38 (C.R.S.Pitman).
1 (M. C. Z. 48395) Butiaba, L. Albert, U. 5.xii.38.
3 (M. C. Z. 48396–7) Ujiji, L. Tanganyika, T. T. 13.iii.39.
5 (M. C. Z. 48398–401) Kitaya, Ruvuma River, T. T. 28.iii.39.
1 (M. C. Z. 48402) Mikindani, s.e. coast, T. T. 18.iv.39.
3 (M. C. Z. 48403–5) Mbanja, near Lindi, T. T. 27.iv.39.
1 (M. C. Z. 48406) Lake Rutamba, near Lindi, T. T. 8.v.39.
6 (M. C. Z. 48407–9) Nchingidi, Rondo Plateau, T. T. 18.v.39.
1 (M. C. Z. 48410) Siga Caves, near Tanga, T. T. 15.vi.39.
2 (M. C. Z. 48411–2) Amboni Estate, Tanga, T. T. 19.vi.39.
7 (M. C. Z. 44115 & Vienna Mus.) Ugano, T. T. 1935–6 (H. Zerny).

Native names. Chijamitela (Kimwera); *nowlendi* (Kimakonde at Kitaya, but thought by both Konde and Yao at Kitaya to be the young of *Psammophis s. sibilans*).

Variation. Midbody scale-rows 19; ventrals 147–178; anal entire; subcaudals 33–48; labials 7–9, the third and fourth, or third, fourth and fifth, or fourth and fifth, or fourth, fifth and sixth entering the orbit; preocular 1, or 2 in three snakes; postoculars 2, or 1 on one

side of one snake; temporals 1 + 1 or 1 + 2; loreal noticeably longer than high in the Butiaba and one Ujiji snakes which, however, are not like *degeni* in any other respect.

Measurements. Largest ♂ (M. C. Z. 48412) measures 608 (513 + 95) mm., largest ♀ (M. C. Z. 47831) measures 533 (460 + 73) mm.

Sexual dimorphism. Though in each locality, when taken separately, males have a higher subcaudal count, in the series as a whole no such separation is possible, despite a careful rechecking of the sexual diagnosis. Ventrals in ♂♂ are 150–172, in ♀ ♀ 147–178; subcaudals in ♂ ♂ are 35–48, in ♀ ♀ 33–45.

Breeding. At Kitaya, March 28, one ♀ held very small ova; on March 31, 5 eggs measuring 22 x 12 mm., thought to be those of this species, were found beneath a heap of vegetable rubbish. At Siga Caves, June 15, a ♀ held 6 eggs measuring 27 x 11 mm.

Diet. Stomach contents at Ujiji consisted of a gecko (*H. mabouia*) and frog (*Hyperolius argentovittis*) in one snake, a toad (*B. r. regularis*) in another; at Kitaya, a green shield-bug of a species which emits a pungent odour; at Ugano, Mbanja and Nchingidi, four frogs (*Arthroleptis s. stenodactylus* and *s. lönnbergi*) in three snakes.

Trimerorhinus tritaeniatus multisquamis Loveridge

Trimerorhinus tritaeniatus multisquamis Loveridge, 1932, Proc. Biol. Soc. Washington, **45**, p. 84: Nairobi, Kenya Colony.

♂ ♀ ♀ (M. C. Z. 48413–5) S. Kinangop Plateau, K. C. 27.x.38.

Taxonomy. As pointed out by Mertens (1937c, Copeia, p. 70), the laudable attempt by Stejneger (1936b, Copeia, p. 139) to avoid complications regarding the genus *Cerastes* by designating a synonym as genotype, was rendered nugatory by the prior action of Fejervary (1923, Zool. Anz., p. 172) in designating *rhombeatus*. *Trimerorhinus* therefore becomes a synonym of *Cerastes* but the employment of a name, so long associated with the horned desert vipers of North Africa, which occurs so frequently both in medical and popular literature appears to me to call for action by the International Committee on Nomenclature on the grounds that 'no name shall be employed if the result will be greater confusion than uniformity' (*c.f* Crossland, 1939, Nature, p. 942).

Variation. Midbody scale-rows 17; ventrals 163–166; anal divided; subcaudals 50–55; labials 8, the fourth and fifth entering the orbit; preoculars 1; postoculars 2; temporals 2 + 3.

Breeding. Both ♀ ♀ held eggs, apparently 7, measuring 16 x 5 mm. That such small snakes should be breeding appears to indicate that the form is dwarfed in the alpine zone at 10,000 feet, where the uncongenial climatic conditions restrict the hours of feeding and basking.

Measurements. The ♂ (M. C. Z. 48413) measures 490 (405 + 85) mm., the larger ♀ (M. C. Z. 48414) measures 516 (426 + 90) mm.

Rhamphiophis rubropunctatus (Fischer)

Dipsina rubropunctatus Fischer. 1884, Jahrb. Hamburg. Wiss. Anst., **1**, p. 7, pl. i, fig. 3: Near Arusha, Tanganyika Territory.

♂ ♂ (M. C. Z. 48416–7) Amboni Estate, nr. Tanga, T. T. 20.iv.39.

Variation. Midbody scale-rows 19; ventrals 220; anal divided; subcaudals 140 & M; labials 8, the fourth and fifth entering the orbit; preoculars 2; postoculars 2; temporals 2 + 3 and 2 + 5.

Measurements. Larger ♂ measures 1492 (1000 + 492) mm., the other, though 15 mm. longer in body, lacks the tip of its tail.

Habitat. Disturbed by a tractor distributing piles of rotting vegetation in a cleared sisal plantation.

Rhamphiophis oxyrhynchus rostratus Peters

Rhamphiophis rostratus Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 624: Tete; Mesuril and Quitangonha, Mozambique.

1 (M. C. Z. 48418) Mikindani, T. T. 21.iv.39.
1 (M. C. Z. 48419) Mbanja, Lindi, T. T. 4.v.39.
1 (M. C. Z. 48420) Siga Caves, T. T. 15.vi.39.

Native name. Ninhyongolihanga (Kimakonde at Mbanja).

Taxonomy. In view of Pitman's finding both the western *oxyrhynchus* and the eastern *rostratus* in Uganda, a subspecific recognition of their close relationship appears advisable.

Variation. Midbody scale-rows 17; ventrals 164–176; anal divided; subcaudals 99 & M: labials 8–9, the fifth entering the orbit; preoculars 2–3; postoculars 2–3; temporals 2 + 3 and 3 + 4.

Measurements. Size of all three moderate, the two larger snakes lack tips to their tails.

Diet. Foot of a small mammal in Mbanja snake.

Habitat. I captured the Siga snake beneath the debris of a collapsed hut at the edge of a large crocodile-inhabited swamp; the Mbanja reptile was taken on the landing field.

Dromophis lineatus (Duméril & Bibron)

Dryophylax lineatus Duméril & Bibron, 1854, Erpét. Gén., **7**, p. 1124: White Nile, Africa.

1 (M. C. Z. 47806) Lira, Lango, U. iv-viii.38 (C.R.S.Pitman).
2 (M. C. Z. 47832) Gulu, Acholi, U. iv-viii.38 (C.R.S.Pitman).

Variation. Midbody scale-rows 17; ventrals 145–152; anal divided; subcaudals 91 & M; labials 8, the fourth and fifth entering the orbit; preocular 1; postoculars 2; temporals 1 + 2.

The data from these specimens were utilized in the recently published (1940c, Bull. Mus. Comp. Zoöl., **87**, pp. 1–69) revision of this genus.

Psammophis sibilans sibilans (Linnaeus)

Coluber sibilans Linnaeus (part), 1758, Syst. Nat., ed. 10, **1**, p. 222: "Asia."

1 (M. C. Z. 47857) Butiaba, U. 29.xi.38.
5 (M. C. Z. 47858–62) Bundibugyo, U. 21.xii.38.
2 (M. C. Z. 47863–4) Kitaya, T. T. 25.iii.39.
3 (M. C. Z. 47865–7) Mikindani, T. T. 11.iv.39.
1 (M. C. Z. 47868) Nchingidi, T. T. 25.v.39.

Distribution. Also seen at Ujiji, Mbanja, and Amboni Estate, Tanganyika; and eight donated by Captain Pitman from Lira, Lango; Serere, Teso; and Gulu, Acholi, Uganda.

Native names. Sebusaru (Lutoro); *nachungu* (Kimakonde and Kiyao).

Coloration. Usually Uganda snakes have well-developed lateral stripes on their dusky gray bellies as is commonly the case with specimens from the Central Lake Region. See revision (Loveridge, 1940c, p. 38) for further comments.

Breeding.

Butiaba,	November 29, ♀	held ? eggs measuring	17 x 11 mm.
Bundibugyo,	December 21, ♀	" 9 " "	15 x 9 mm.

Diet, etc. At Mbanja I was sitting on a low veranda, my feet upon the ground, when there was a rushing sound in the foot-high grass beside me, and a skink (*Mabuya v. varia*) dashed out and into another patch on my left. As my eyes swung back from following its flight I was aware of, rather than saw, the arrival of a four-foot hissing sand snake which halted the pursuit, its head poised nine inches from the ground, within a foot of me. Before I could take action, it turned, and, like a flash, disappeared into the grass from which it had emerged: I searched for it immediately but in vain.

At Nchingidi I passed close by a large (1336 mm.) snake as it lay basking beside a narrow path. Returning, I picked it up by the back of the neck without it offering any serious resistance: no stick was employed. The reptile was, in fact, almost moribund, yet I found no nematodes in its stomach—only the tail of a Sundevall's skink *Riopa sundevallii*) and a little fur of some mammal (? Crocidura); nor had it suffered any injury.

Parasites. Numerous nematodes (*Ophidascaris sp.* probably *O. mombasica*) in the Butiaba snake.

Enemies. A large sand-snake, as well as two *P. s. sudanensis*, recovered from the stomach of an eagle (*Circaëtus cinereus*) at Amboni, near Tanga.

Psammophis subtaeniatus sudanensis Werner

Psammophis subtaeniatus var. *sudanensis* Werner, 1940, Denks. Akad. Wiss. Wien, **96**, p. 504: Kadugali, Anglo-Egyptian Sudan.

1 (M. C. Z. 47869) Kitaya, Ruvuma R., T. T. 3.iv.39.
7 (M. C. Z. 47870–6) Mikindani, T. T. 10–11.iv.39.
1 (M. C. Z. 47877) Nchingidi, T. T. 13.iv.39.
2 (M. C. Z. 47878–9) Amboni Estate, T. T. 20.vi.39.

Distribution. Also occurs at Mbanja, near Lindi, southeastern T. T.

Native name. *Naru* (Kimakonde and Kimwera).

Variation. Embodied in the recently published revision of the genus *Psammophis* (1940c, Bull. Mus. Comp. Zoöl., **87**, pp. 1–69).

Diet. A frog (*Arthroleptis s. stenodactylus*) in each of two Mikindani snakes.

Enemies. Three adults recovered from the stomach of one eagle (*Circaetus cinereus*) shot at Mikindani, and two from another eagle of the same species killed on Amboni Estate, near Tanga.

Thelotornis kirtlandii kirtlandii (Hallowell)

Leptophis Kirtlandii Hallowell, 1844, Proc. Acad. Nat. Sci. Philadelphia, p. 62: Liberia.

♂ (M. C. Z. 48421) Bundibugyo, U. 21.xii.38.

Native name. *Mbeya* (Luamba).

Remarks. Boulenger (1896d, p. 186) separated his material into two groups on the basis of certain colour characters. Boettger in 1913, and Mertens in 1937, rightly treated the southeastern form as a variety or race under the name of *T. k. capensis* Smith. More recently Bogert

(1940, p. 70) raised the latter to specific rank. This disposition, however, cannot be accepted in view of the intermediate nature of most East African specimens which renders their allocation to one race or the other almost arbitrary.

If, after examination of a topotype Liberian *kirtlandii* and topotype Natal *capensis*, one applies the differential characters cited by Bogert to a series of eleven snakes from Amani, Usambara Mountains, one finds that all have immaculate crowns but only three, of which two are young, have almost immaculate labials. Half the series have the rostral strongly recurved (though not so strongly as in Liberia), the rest agree with *capensis*. Half the series possess nasals which show well from above, the rest are indistinguishable from *capensis*. Only four of them have less than 161 ventrals, viz. 158, 158, 159 and 160. The same variability holds good for material from the Uluguru Mountains, all of which I refer to *kirtlandii* on the basis of the immaculate upper surface of the head. On the other hand material from the savanna areas and southern Tanganyika Territory are definitely much nearer to *capensis*.

After examination of the 150 titles in the literature and tabulating the available data for ventral and subcaudal counts of 93 snakes, I have eliminated the few which are so extreme as to appear erroneous and made appropriate allocation of the remainder to their geographical form. The resultant ranges overlap so heavily that I reject them for diagnostic regions; the numbers in parenthesis give the extent of variation.

T. k. kirtlandii has ventrals 155–189 (35); subcaudals 137–175 (39).
T. k. capensis " " 147–170 (24); " 130–166 (37).

After omitting also the hemipeneal character advanced by Bogert, I cannot improve on his diagnostic characters but amend the range. The two forms may be separated as follows, though IT SHOULD BE BORNE IN MIND THAT TANGANYIKA AND ANGOLA ARE AREAS OF INTERMEDIATES.

Rostral and anterior ends of nasals broadly visible from above; crown of head immaculate, labials more or less immaculate, neck cross-banded. Inhabits forested areas of tropical Africa from Liberia to northern Angola, east to southern Somaliland and[1] central Tanganyika Territory . . . . *k. kirtlandii*
Rostral and anterior ends of nasals narrowly visible from above; crown of head speckled with black, labials heavily speckled with black,

[1] An occasional lowland specimen in the Voi region, southeast Kenya may preponderate in *capensis* attributes.

neck not cross-banded though black lateral blotches usually present; range: savanna areas of semitropical Africa from central Angola and central Tanganyika Territory south to Natal............*k. capensis*

Diet. An arboreal lizard (*Agama atricollis*) in its stomach, a ♀ snake from Buta, Bas Uele, Belgian Congo, had swallowed a skink (*Mabuya m. maculilabris*) and then two large nestling weavers (*Spermophaga r. ruficapilla*) which Dr. J. P. Chapin kindly identified for me.

Thelotornis kirtlandii capensis Smith

Thelotornis capensis A. Smith, 1849, Illus. Zool. S. Africa, **3**, App., p. 19: Kaffirland and the country towards Port Natal.

♂ ♀ (M. C. Z. 48422–3) Kitaya, T. T. 28.iii.39.
♀ (M. C. Z. 48424) Mikindani, T. T. 13.iv.39.
♂ ♀ (M. C. Z. 48425–6) Nchingidi, T. T. 18.v.39.

Distribution. For distribution of this form, see remarks above.

Native names. *Lukukuti* (Kiyao); *lukukutu* (Kimakonde); *likukutu* (Kimawiha). These small variations were carefully checked and discussed with the elders of these tribes.

Variation. Midbody scale-rows 19; ventrals 154–159; anal divided; subcaudals 137–163; labials 8, the fourth and fifth, or third, fourth and fifth, entering the orbit; preocular 1; postoculars 3; loreals 2.

Measurements. The largest, a ♂ (M. C. Z. 48425), measures 1453 (875 + 578) mm.

Diet. Feathers of a finch or weaver in a Kitaya snake, toads (*Breviceps mossambicus*) in both Nchingidi specimens, the smaller having eaten a very young toad. The presence of burrowing toads in an arboreal snake bears out the observation that the bird snake frequently descends to the ground.

Dispholidus typus (Smith)

Bucephalus typus A. Smith, 1829, Zool. Journ., **4**, p. 441: Old Latakoo, South Africa.

♂ juv. (M. C. Z. 48427) Mabira Forest, U. 12.xi.38.

Native name. *Kalwekalwe* (Luganda).

Variation. Midbody scale-rows 19; ventrals 188; anal divided; subcaudals 108; labials 7, third and fourth entering the orbit.

Habitat. This pinkish brown juvenile was entwined among some coffee berries on a tree growing at the forest edge, Mubango.

Calamelaps unicolor warreni Boulenger

Calamelaps warreni Boulenger, 1908b, Ann. Natal Mus., **1**, pp. 230, 234, fig. 3: Kosi Bay, Zululand.

Calamelaps mellandi Boulenger, 1915a, Proc. Zool. Soc. London, p. 214: Chirini Island, Lake Bangweulu, Northern Rhodesia.

♀ (M. C. Z. 48428) Mbanja nr. Lindi, T. T. 5.v.39.
♀ (M. C. Z. 48429) Nchingidi, Rondo, T. T. 18.v.39.
♀ (M. C. Z. 48430) Amboni Estate, T. T. 21.vi.39.

Native name. *Mbitu* (Kimakonde at Mbanja, but applied to amphisbaenids also).

Variation. Midbody scale-rows 19; ventrals 193–203; anal divided; subcaudals 17–19; labials 6, the third and fourth entering the orbit.

Remarks. Misled by the confusing records of Tanganyika Territory —where three races occur—I (1933h, p. 260) united several forms under the oldest name, *unicolor* (Reinhardt). Like *Thelotornis k. kirtlandii*, however, the western *unicolor* occurs on the forested or recently deforested, areas (Teita; Usambara and Uluguru Mtns.) in the east, but also on the coast (early German records of Peccetoni, Mombasa and Bagamoyo, which should be reexamined). Otherwise the East Coast form is *warreni*, while the Angolan race *polylepis* just penetrates the southwestern corner of Tanganyika Territory with the single example from Tukuyu (Langenburg) recorded by Tornier (1901a, Zool. Jahrb. Syst., **14**, p. 86).

After elimination of *Calamelaps pellegrini* Angel, 1921—which I regard as a synonym of *Rhinocalamus ventrimaculatus* Roux, 1907—I have revised the genus, utilizing all records and the *concolor* and *unicolor* material in the Museum of Comparative Zoölogy. The following key is offered as a result.

Key to the Species

1. Frontal as long as, or shorter than, its distance from the *rostral*; temporals 1 + 1; upper labials 7; fifth lower labial largest; posterior sublinguals as long as, or almost as long as, the anterior; ventrals 133–148; range: Natal . . . .*concolor* (inc. *mironi*)

   Frontal as long as, or longer than, its distance from the end of the *snout;* temporal 1 only; upper labials 6 or 5; fourth lower labial largest; posterior sublinguals often scarcely differentiated, if distinct then much shorter than the anterior; ventrals 161–194; unknown in Natal . . . . .2.

2. Midbody scales in 21 rows; range: Angola and Transvaal north to extreme southwestern Tanganyika Territory (at Tukuyu nr. Lake Nyasa) . . . . *u. polylepis* (inc. *miolepis*)
   Midbody scales in 19 to 15 rows . . . . 3.
3. Midbody scales in 19 rows; range: Southern Rhodesia (at Empandeni, where it meets with *polylepis*) and Zululand, north to Kenya Colony (at Ngatana, Tana River)
   u. warreni (inc. *mellandi*)
   Midbody scales in 17 to 15 rows . . . . 4.
4. Midbody scales in 17 rows; range: Tanganyika Territory (Uluguru Mtns.) north to Kenya Colony (at Peccatoni, *fide* Boettger) west to Sierra Leone and "Guinea"
   u. unicolor (inc. *hildebrandtii* and *niangarae*)
   Midbody scales in 15 rows; range Portuguese Guinea (Rio Cassine, known only from the type) . . . . *u. feae*

Sexual dimorphism. The marked dimorphism in the number of subcaudals in the races of *unicolor* is best shown in tabular form. It is important to note, however, that *the sexes have had to be assumed in the case of polylepis* as authors have not furnished the sex, moreover, though Boulenger stated that the type of *feae* was a ♂, from the scale-counts it would appear to be ♀.

	♂♂.	♀♀.		♂♂	♀♀.	
C. u. polylepis	163–194,	200–212	ventrals;	27–27,	16–20	subcaudals.
C. u. warreni	161–177,	179–203	ventrals;	26–30,	17–21	subcaudals.
C. u. unicolor	164–182,	201–208	ventrals;	28–38,	21–27	subcaudals.
C. u. feae		196.	ventrals;		23	subcaudals.

Habitat. The Mbanja snake was dug up and brought in alive, the *very* fat Nchingidi female was wandering on a path near camp shortly after daybreak, the Amboni specimen was ploughed up by tractor.

MIODON and its forms

Since the turn of the century, the most valuable contribution to an understanding of this genus is that contributed by Bogert (1940, p. 45) who has painstakingly investigated the vexed question of its dentition in relation to that of its synonym *Cynodontophis* Werner.

When, however, he refers *collaris* to the synonymy of *gabonensis* (Duméril), it is largely in the sense of *gabonensis* Boulenger, which appears to me to be a composite. Apparently Boulenger had no ex-

amples of the striped form and the material which he referred to *gabonensis* was, in reality, *collaris*.

It seems to me that within the genus we have a transAfrican (west to east) series of species or races beginning with the Liberian 5-striped *acanthias*, passing to the 3-striped *g. gabonensis* (inc. *neuwiedi*) and the 2-row spotted *notatus* (inc. *aemulans*) to *g. collaris* (inc. *fulvicollis*, *caecutiens* and *werneri*) of the Cameroon and Congo, passing into often entirely and uniformly black *christyi* (inc. *unicolor*) of Uganda and *graueri*.

When better known it may be that *graueri* and *notatus* will have to be regarded as full species on the grounds of their lower number of subcaudals in both sexes, particularly noticeable in the case of *graueri*. Owing to the non-sexing of much of the material referred to in the literature, the following ranges must be regarded as largely hypothetical, but they are founded on a basis of sexed snakes.

Suggested range of scale-counts by sex, the latter sometimes assumed.

Species	♂♂ ventrals	♀♀ ventrals	♀♀ caudals	♂♂ caudals
acanthias	183–195	207–216	16–18	–22
g. gabonensis	219–238	–246	11–	–21
g. notatus	178–228	201–	14–	17–19
g. collaris	200–232	195–252	15–19	19–25
g. christyi	202–217	221–241	15–18	19–24
g. graueri	237–238	254–258	13	16–18

Key to the Species

1. Anal entire; dorsum with pattern of 5 parallel black lines; ventrals 183–216; subcaudals 16–22; range: Sierra Leone to Togoland (or Nigeria, *fide* Angel) . . . . *acanthias*
   Anal divided[1] . . . . 2.
2. Dorsum with pattern of 3 parallel black lines; ventrals 219–246; subcaudals 11– 21; range: Gold Coast to Dahomey (with type allegedly from Gabon, *i.e.* French Congo) . . . . *g. gabonensis*
   Dorsum without pattern of parallel black lines . . . . 3.
3. Dorsum with pattern of 2 parallel series of black spots; ventrals 178–228; subcaudals 14–19; range: French Cameroon south to French Congo . . . . *g. notatus*
   Dorsum uniformly dark . . . . 4.

[1] Allegedly entire in a Congo specimen of *M. g. collaris fide* Bocage (1895a, p. 126).

4. Nape and crown pale fawn with dark mottlings; throat white; ventrals 181–252; subcaudals 15–25; range: (Togo! *fide* Werner) southeastern Nigeria south to Angola east to Uganda (west of Ruwenzori) . . . . *g. collaris*
   Nape and crown of head entirely black, or with a sharply distinct broad white band across the parietal region . . . . 5.
5. Top of head iridescent black like nape and dorsum; throat white or black; ventrals 202–241; subcaudals 15–21; range: western Congo (Poko) east to central Uganda (Mabira Forest) . *g. christyi*
   Top of head from snout to behind eyes, black, posterior half of head and nape pure white; ventrals 237–258; subcaudals 13–18; range: eastern Congo (Idjwi Island, Lake Kivu) to central Uganda (Entebbe) . . . . *g. graueri*

Miodon gabonensis collaris (Peters)

Microsoma collare Peters, 1881, Sitz. Ges. Naturf. Freunde. Berlin, p. 148; Macange, Cuango = Kwango, French Equatorial Africa.

♂ (M. C. Z. 48431) Bundibugyo, U. 22.xii.38.

Distribution. This constitutes the first record for *collaris* in Uganda, but Bundibugyo—in the Bwamba country northwest of the Ruwenzori Mountains—is really a part of the Ituri Forest region.

Variation. Midbody scale-rows 15; ventrals 211; anal divided; subcaudals 23.

Coloration. Quite typical. Head and nape light fulvous with a few dark markings on the frontal region, dorsum irridescent plumbeous with the edges of the scales darker. Below, pure white except for the dorsal coloration impinging on the outer lateral edges of the ventrals.

Measurements. Total length of ♀, 237 (315 + 22) mm.

Miodon gabonensis graueri Sternfeld

Miodon Graueri Sternfeld, 1908, Sitz. Ges. Naturf. Freunde Berlin, p. 94: Entebbe, Uganda.

♂ ♀ ♀ (M. C. Z. 48432–3) Idjwi Id., B. C. 21–22.ii.39.

Distribution. These constitute the first records of this form in the Belgian Congo; *graueri* being known until now only from the type.

Variation. Midbody scale-rows 15; ventrals 237–258; anal divided; subcaudals 13–16. The ♂ has 237 (type had 238) ventrals, and 16 (type had 18) subcaudals. The ♀ ♀ have 254–258 ventrals and only 13 subcaudals, indicating a slight sexual dimorphism.

Measurements. Total length of ♂ (to go to Mus. Congo Belge) 325 (310 + 15) mm.; of larger ♀ (M. C. Z. 48432) 370 (358 + 12) mm.

Diet. Remains of a blind snake (*Typhlops b. lestradei*) in male, an egg, possibly a lizard's, in one of the females.

Habitat. The two females were taken near the lake shore, where, according to the native captor, the species is usually encountered. The male, however, was killed when crossing a path about a mile below our camp, *circa* 6000 feet? As the type locality, Entebbe, is also on the lake (Victoria) shore, perhaps this race favours such an environment.

APARALLACTUS MODESTUS (Günther)

Elapops modestus Günther, 1859, Ann. Mag. Nat. Hist. (3), **4**, p. 161, pl. iv, fig. C: West Africa.

Periaspis plumbeatra Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 252: Liberia.

Elapops (*Calamaria*) *Petersi* Jan, 1862, Arch. Zool. Anat. Fisiol., **2**, p. 32: Gold Coast.

Aparallactus boulengeri Werner, 1896, Verh. Zool. Bot. Ges. Wien, **46**, p. 363, pl. vi, figs. 6–6b: Cameroon.

Aparallactus peraffinis Werner, 1897, Verh. Zool. Bot. Ges. Wien, **47**, p. 404, pl. ii, fig. 3: Interior of Cameroon.

Aparallactus ubangensis* Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19, fig.: Zongo, Ubangi Rapids, Belgian Congo.

Aparallactus flavitorques Boulenger, 1901, Ann. Musée Congo (1), **2**, p. 11, pl. iv, fig. 3: Lubué, Kasai, Belgian Congo.

Aparallactus dolloi* Werner, 1902, Verh. Zool. Bot. Ges. Wien, **52, p. 346: Banzyville, Ubangi River, Belgian Congo.

Aparallactus congicus* Werner, 1902, Verh. Zool. Bot. Ges. Wien, **52, p. 346: Lingunda, Belgian Congo.

Aparallactus Batesii* Boulenger, 1907, Ann. Mag. Nat. Hist. (7), **19, p. 325: 5 miles inland from Kribi, French Cameroon.

Aparallactus christyi Boulenger, 1910, Ann. Mag. Nat. Hist. (8), **5**, p. 512: Mabira Forest, Chagwe, Uganda.

Aparallactus nigrocollaris* Chabanaud, 1917 (1916), Bull. Mus. Nat. Hist. Paris, **22, p. 377, figs. 18–19: French Congo.

Aparallactus nigrocollaris Roucheti* Chabanaud, 1917 (1916), Bull. Mus. Nat. Hist. Paris, **22, p. 378, figs. 20–21: French Congo.

Guyomarchia unicolor Angel, 1923, Bull. Mus. Nat. Hist. Paris, **29**, p. 348, figs. 1–4: French Congo (probably from near Sangha).

Aparallactus Graueri* Werner, 1924, Sitz. Akad. Wiss. Wien, **133, p. 42: Beni, Belgian Congo.

♂ ♀ (M. C. Z. 48435–6) Mabira Forest, U. 13.xi.38.
♀ (M. C. Z. 48437) Budongo Forest, U. 29.xi.38.
♂ (M. C. Z. 48438) Bundibugyo, U. 22.xii.38.

* Here referred to the synonymy for the first time as a result of a revision of the genus now in MS.

Native name. *Kileba* (Luamba).

Synonymy. I was particularly anxious to obtain topotypes of *christyi*, a species which Parker (in Pitman, 1937, p. 338) recently detected as synonymous with *modestus*, for I thought it might be possible to recognize it as an eastern form of this sylvicoline snake. On the contrary, however, the generic revision which resulted showed it necessary to add seven additional alleged species (as indicated above with an asterisk) to the already lengthy synonymy. This 'lumping' has not been done in any spirit of desperation, but after careful consideration of the claims of each species in conjunction with a study of the extensive series of *modestus* in the Museum of Comparative Zoölogy. The reasons for this synonymizing will be furnished later upon publication of the revision. The only one of which there could be the slightest doubt is *nigrocollaris* (inc. *roueheti*) which I regard as an aberration; it has twice been taken in Uganda by Pitman.

As long ago as 1923, Schmidt pointed out that this species has teeth which may, or may not, be grooved, but it is only recently that Bogert (1940, p. 43) presented the argument for merging *Elapops* with *Aparallactus*.

Variation. Midbody scale-rows 15; ventrals 135–157; anal entire; subcaudals 36–43; labials 7, the third and fourth entering the orbit.

Measurements. The larger ♂ (M. C. Z. 48438) measures 348 (288 + 60) mm. and smaller ♀ (M. C. Z. 48436) 503 (435 + 68) mm.

Breeding. The latter held 7 eggs, the average size of which is about 25 x 8 mm.

APARALLACTUS JACKSONII (Günther)

Uriechis Jacksonii Günther, 1888, Ann. Mag. Nat. Hist. (6), **1**, p. 325, pl. xix, fig. E: Foot of Mt. Kilimanjaro, Tanganyika Territory.

♀ (M. C. Z. 48442) Nchingidi, Rondo Plateau, T. T. 17.v.39.

Variation. Midbody scale-rows 15; ventrals 156; anal entire; subcaudals 44; labials 7, the third and fourth entering the orbit.

Coloration. In life. Above, head black, a six-scale wide black, transverse band, edged before and behind by scale-wide bands of bright yellow, on nape; back and tail a delicate pinkish brown. Below, bright yellow, the lower ends of the black collar not extending on to the ventrals.

Measurements. Total length of this, the largest known ♀, 259 (213 + 46) mm.

Aparallactus werneri Boulenger

Aparallactus werneri Boulenger, 1895, Ann. Mag. Nat. Hist. (6), **16**, p. 172: Usambara Mountains, Tanganyika Territory.

♂ ♂ (M. C. Z. 48445–6) Magrotto Mtn., T. T. 1.vii.39.

Variation. Midbody scale-rows 15; ventrals 145–148; anal entire; subcaudals 41 & M; labials 6, the second and third entering the orbit.

Coloration. In life. Above, head black, a six-scale wide black, transverse band, separated from the head by a scale-wide olive band, on nape; back and tail olive. Below, bright lemon yellow except for throat which is tinged with whitish.

Measurements. Total length of larger ♂, 308 (255 + 53) mm.

Aparallactus capensis uluguruensis Barbour & Loveridge

Aparallactus uluguruensis Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 132: Nyange, Uluguru Mountains, Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 48439–41) Magrotto Mountain, T. T. 1.vii.39.

Remarks. A. uluguruensis was based on eleven uniformly plumbeous specimens from the Uluguru and Usambara Mountains, a revisionary study of the genus reveals that it differs in no essential from the pale fawn *capensis* of the savanna except in its much larger size and in colour, moreover, small snakes intermediate in colour are to be found on the recently deforested western Usambara, Kilimanjaro and on Mount Mbololo. I propose to regard *uluguruensis* as a race of *capensis* though the latter is undoubtedly descended from the virgin forest form.

I was in error in referring *A. concolor boulengeri* to the synonymy of *uluguruensis* as has been pointed out by Scortecci. At the time I attributed less importance to the first lower labials being in contact than I should have done.

Variation. Midbody scale-rows 15; ventrals 140–158; anal entire; subcaudals 43–44; labials 7, the third and fourth entering the orbit.

Diet. A centipede in the stomach of the larger male.

Aparallactus capensis capensis Smith

Aparallactus capensis A. Smith, 1849, Ill. Zool. S. Africa, Rept., App., p. 16: Kaffirland to the eastward of Cape Colony.

♀ (M. C. Z. 48443) Ujiji, T. T. 12.iii.39.
♀ (M. C. Z. 48444) Mbanja, T. T. 27.iv.39.

Native name. *Yamitera* (Kimakonde).

Remarks. I now confirm my (1936j, p. 269) previous suggestion that *punctatolineatus* is a synonym of *capensis*. Peter's *nigriceps* is a good species with only 108–123 ventrals and 20–35 subcaudals, but *nigriceps* of Boulenger (1896d, p. 260) is a composite of Peter's original description and a specimen of *capensis*, for the latter may have 6 upper labials, second and third entering the orbit (left side of head of Mbanja snake) or 7 upper labials, third and fourth entering the orbit (right side of head of Mbanja snake), the latter being the normal condition for *capensis* though the former crops up throughout its range as in the Ujiji snake and in the ♀ of a pair collected on Mount Mbololo, Kenya Colony.

In studying the genus, it was interesting to note that a block of six western and northern species invariably possess seven upper labials of which the third and fourth enter the orbit. On the other hand, three eastern species (*werneri*, *turneri* and *nigriceps*) have six labials, the second and third entering the orbit. Three other forms, (*c. uluguruensis, c. capensis* and *bocagii*), for *bocagii* is scarcely more than a western form of *capensis*, occupy an intermediate position normally having seven labials but not infrequently six, resulting in confusion with *nigriceps sensu strictu*.

Variation. Midbody scale-rows 15; ventrals 162–162; anal entire; subcaudals 41–44; labials 6–7, see remarks above.

Breeding. At Mbanja, on April 27, a ♀ held 2 eggs, each measuring 31 x 4 mm.

Elapsoidea güntherii Bocage

Elapsoidea güntherii Bocage, 1866, Jorn. Sci. Lisboa, **1**, p. 70, pl. i, figs. 3–3b: Cabinda, Portuguese Congo; Bissao, Portuguese Guinea.

♂ (M. C. Z. 48447) Mabira Forest, U. 14.xi.38.
12 (M. C. Z. 48448–56) Magrotto Mtn., T. T. 1–19.vii.39.

Native name. *Kifutu* (Kisambara).

Variation. Midbody scale-rows 13; ventrals 150–157; anal entire; subcaudals 15–25; labials 7, the third and fourth entering the orbit except on left side of M. C. Z. 48453, where it is 8, the fourth and fifth entering.

Measurements. Largest ♂ (M. C. Z. 48448) measures 585 (548 + 37) mm.; largest ♀ (M. C. Z. 48453) only 401 (377 + 24) mm.

Sexual dimorphism. 10 ♂ ♂ have 151–157 ventrals and 19–25 subcaudals while the 3 ♀ ♀ have 150–157 ventrals and 15–16 subcaudals.

Diet. The only food present was a caecilian (*Boulengerula boulengeri*) in the stomach of a Magrotto snake.

Enemies. Two of the males had lost the ends of their tails, perhaps through fighting, one had a very truncated stump.

Habitat. With the exception of the Mabira snake, which I caught in rank grass between the kitchen and back door, the other four that I captured personally were wandering on paths towards evening, their empty stomachs suggesting the cause for their being abroad.

NAJA HAJE HAJE (Linnaeus)

Coluber haje Linnaeus, 1762, in Hasselquist, Reise Palestine, p. 386: Lower Egypt.

♂ ♂ (M. C. Z. 47808) Lira, Lango, U. iv–viii.38.
♀ (M. C. Z. 47809) Gulu, Acholi, U. ix–x.38.

Distribution. Lt. Col. C. R. S. Pitman, to whom we are indebted for these juvenile Egyptian cobras, tells me that the species is plentiful on the flats along the eastern shores of Lake Albert where specimens eight feet in length are not uncommon. The largest he has measured was eight and a half feet.

Variation. Midbody scale-rows 21; ventrals 54–60; anal entire (♂ ♂) or divided (♀); upper labials 7, separated from the orbit by suboculars.

NAJA NIGRICOLLIS NIGRICOLLIS Reinhardt

Naja nigricollis Reinhardt, 1843, Dansk. Vidensk. Selsk. Skrift., **10**, p. 269, pl. iii, figs. 5 and 7: Guinea.

♀ ♀ (M. C. Z. 48457–8) Kitaya, T. T. 29.iii & 2.iv.39.
♂ ♀ (M. C. Z. 48459–60) Mikindani, T. T. 20.iv.39.
♂ (M. C. Z. 48461) Mbanja near Lindi, T. T. 29.iv.39.
♀ (M. C. Z. 48462) Magrotto Mountain, T. T. 8.vii.39.

Native names. *Liteweo* (Kiyao); *lilekela* (Kimawiha); *lipatera* (Kimakonde at Kitaya); *lipeta* (Kimakonde at Mbanja); *sweela* (Kisambara).

Variation. Midbody scale-rows 21; ventrals 183–204; anal entire; subcaudals 48–58; labials 6, the third entering the orbit.

Coloration. The five southeastern snakes are all of the form *mossambica*, the juvenile from forested Magrotto was uniformly black except for white crossbars on throat.

Measurements. Largest ♂ (M. C. Z. 48460) measures 1228 (1007 + 221) mm.; largest ♀ (M. C. Z. 48459) measures 1061 (880 + 181) mm.

Diet. Four young rats (*Rattus r. kijabius*) in a Kitaya cobra, a large shrew (*Crocidura h. hirta*) in the young Mbanja snake.

Parasites. Ticks (*Aponomma falsolaeve*) and worms at Kitaya.

Enemies. The large Kitaya ♀ has lost practically its entire tail, the stump, long since healed, terminates close behind the anus.

Defence. Mr. H. Tanner of Amboni Estate, near Tanga, tells me that he was called upon to kill one of these cobras on the driveway in front of his house. He shot it at close range with the result that the charge severed head and neck from body, and the blast carried the head and neck to where his son was standing some distance away. The head, rearing on its stump, opened its mouth and discharged two jets of venom at the boy.

This interesting case of reflex action may, I consider, be entirely relied upon, as Mr. Tanner, who formerly kept cobras and other snakes, is deeply interested in natural history. During my brief stay on his estate a native killed a black cobra near my tent, it was not preserved as he had chopped it in half with his bush knife (*panga*).

Venom. Sir Charles Belcher, the ornithologist, with whom I hunted reptiles earlier in the trip, writes (1941) me that, when collecting at Soysambu, near Lake Elmenteita, he encountered four bat-eared fox (*Otocyon m. virgatus*) cubs playing about a big black cobra. The head of the latter was upraised three feet from the ground, and when Sir Charles struck at the reptile with an ashplant he was carrying, the snake discharged its venom full in his face from a distance of about three feet. Fortunately his eyes were protected by the glasses he was wearing, but he received a spray of the bitter tasting venom full in the lips. Later, when washing, he got a fresh taste of the poison.

Naja melanoleuca Hallowell

Naia haie var. *melanoleuca* Hallowell, 1857, Proc. Acad. Nat. Sci. Philadelphia, p. 61: Gaboon.

♂ ♂ (M. C. Z. 48463–4) Mabira Forest, U. 15.xi.38.
♂ (M. C. Z. 48465) Budongo Forest, U. 22.xi.38.
♂ (M. C. Z. 48466) Bundibugyo, U. 23.xii.38.
5 ♂ ♂, 2 ♀ ♀ (M. C. Z. 48467–71) Idjwi Id., B. C. 19–28.ii.39.
♂ (M. C. Z. 48472) Mikindani, T. T. 20.iv.39.

Distribution. This Mikindani snake involves a mainland southeastward extension in range of 500 miles. Pakenham has recently collected several on Zanzibar, where, however, they may have been

introduced by escapees from the Wayeye 'snake-charmers' who visit the island from time to time.

Lt. Col. Pitman has recently presented us with examples of this cobra from Lira, Lango Province, and Gulu, Acholi Province, Uganda, where they occur together with *Naja h. haje*.

Native names. *Nsweela* (Luganda); *nehewera* (Lutoro); *bata* (Luamba); *irizi* (Lulega). Not distinguished from *N. n. nigricollis* by the Makonde and Mawiha at Mikindani.

Variation. Midbody scale-rows 19; ventrals 197–220; anal entire; subcaudals 59–71; upper labials 7, the third and fourth entering the orbit, sixth largest and in contact with postoculars.

Coloration. This usually jet black forest cobra is very variable on Idjwi Island; one ♂ was brown anteriorly, and black posteriorly; some were all black, others brown mottled with black. The latter type of coloration reaches its climax in the Mikindani snake which is light brown peppered with darker in conformity with its savanna habitat in this locality.

Measurements. Largest ♂ (Mikindani) measures 2364 (1960 + 404) mm.; largest ♀ (Idjwi Island) measures 1625 (1355 + 270) mm.

Diet. A lizard (*Algiroides africanus*) was present in the third-grown cobra from Mabira; half-grown egg-eating snakes (*Dasypeltis s. palmarum*) in each of three young or half-grown cobras on Idjwi Island; two new-born rats (*Lophuromys a. laticeps*) in another from the same locality!

At Budongo Forest camp I was summoned at 3:15 one afternoon to catch a cobra which had been disturbed while swallowing a rat on a garden path. The reptile, with rat in mouth, had darted into a long pile of rubbish, mostly matete grass, piled against a fallen and rotting tree trunk. Peering in, I caught a glimpse of its disappearing tail. We cleared the rubbish, turned the log, but failed to find the cobra in the maze of rat holes down which it had vanished.

Parasites. Ticks (*Aponomma falsolaere*) and a heavy infestation of nematodes (*Kalicephalus sp.*; *Ophidascaris naiae*) was present in one of the Idjwi Island cobras.

Habits. The six-pound cobra measuring about seven and a half feet, was killed in the Mikindani bush by a native. The man surprised it sunning, crept up and struck it a blow. The snake made off and climbed a tree. The native then cut two long poles, split one and inserted the other some little way down the cleft; with this weapon he reached up into the tree and caught the snake in the cleft by withdrawing the second pole. After pulling the snake down he was then in a position to

belabour it with the free pole while holding it at a safe distance in the fork of the other. The man told me that the snake made no attempt to 'spit' under conditions where it certainly would have done so if able. He brought the reptile to me under the impression that it was a python and I had some difficulty in convincing him to the contrary.

In this connection it is worth recording that Mr. H. Tanner of Amboni Estate, told me that he had once run over a strange-looking cobra, as large as a python, while motoring not far from my camp at Siga Caves. Looking back he saw the snake in the road, rear up and spread its hood.

Pseudohaje goldii (Boulenger)

Naia goldii Boulenger, 1895, Ann. Mag. Nat. Hist. (6) **16**, p. 34: Asaba, Niger River, Nigeria.

♂ (M. C. Z. 48473) Bundibugyo, U. 22.xii.38.

Distribution. This three-pound snake, is not only the second record for its occurrence in Uganda, but, being only 7 feet, 1 inch in length, is surpassed by several Congo snakes recorded by Bogert (1942a, p. 6) in his important paper re-establishing Günther's genus *Pseudohaje*.

Native names. Neither Bwamba nor Batoro distinguish it from *N. melanoleuca* to which they apply the same names, viz. *bata* and *nchewera*.

Variation. Midbody scale-rows 15; ventrals 199; anal entire; subcaudals 82; labials 7, the third and fourth entering the orbit.

Coloration. This is as described by Boulenger except that the anterior ventrals are pink in alcohol, not white.

Measurements. Total length of ♂, 2175 (1730 + 445) mm.

Dendroaspis angusticeps (Smith)

Naia angusticeps A. Smith, 1849, Illus. Zool. S. Africa, Rept., pl. lxx: Natal.

5 ♀ ♀ (M. C. Z. 48474–6) Kitaya, Ruvuma R., T. T. 25–30.iii.39.
♂ ♀ (M. C. Z. 48477–8) Nchingidi, Rondo Plat., T. T. 11.v.39.
2 ♀ ♀ (M. C. Z. 48479–80) Magrotto Mountain, T. T. 8–12.vii.39.

Native names. *Namasambi* (Kiyao); *namahamba* (Kimakonde); *ngoe* (Kisambara, but it is thought to be the adult of *Philothamnus s. semivariegatus*).

Variation. Midbody scale-rows 19–23; ventrals 111–126; anal divided; upper labials 7–9, the fourth entering the orbit.

Coloration. The smaller Magrotto ♀ was a rich green, very sparsely flecked with yellow above and below; the larger Magrotto ♀ was olive, though about 300 mm. smaller than the very rich green Nchingidi ♂.

Measurements. The only ♂ (M. C. Z. 48477) measures 7 feet (1640 mm. from snout to anus, end of tail missing); the largest ♀ (M. C. Z. 48474) measures 1981 (1515 + 466) mm.

Diet. A short-tailed nestling rodent in one Kitaya snake; three young rats in the smaller Magrotto mamba.

At Nchingidi my attention was attracted by the vociferous calling of a bulbul (*Phyllastrephus flavostriatus tenuirostris*) in thick forest. I shot the bird and my gunbearer ran in to recover the corpse; as he did so the flickering of a leaf in the dense verdure from whence the bulbul had fallen, directed my gaze to a large and beautiful green mamba which was almost 'swimming' over the foliage. I halted it with a charge of No. 12 from the .410, but as it seemed to be recovering I gave it No. 8 from the second barrel in the heart while it was still twenty feet above ground. Its stomach was empty.

Dendroaspis jamesoni kaimosae (Loveridge)

Dendraspis jamesoni kaimosae Loveridge, 1936, Proc. Biol. Soc. Washington, **49**, p. 64: Kaimosi, Kakamega, Kenya Colony.

♂ (M. C. Z. 48481) Mabira Forest, U. 18.xi.38.
4 ♂ ♂ 8 ♀ ♀ (M. C. Z. 48482–91) Idjwi Id., B. C. 18–28.ii.39.

Native names. *Temankima* (Luganda); *mkubwe* (Lulega).

Variation. Midbody scale-rows 15–17; ventrals 208–226; anal divided; subcaudals 96–111; labials 8, rarely 7, the fourth entering the orbit.

The tails, being uniformly black, are characteristic of the eastern race (*kaimosae*), but the Lake Kivu series, coming as they do from a geographically intermediate area, increase the overlap between the subcaudal counts of the two races, that of the western form (*jamesoni*) being 103–122.

Measurements. Largest ♂ (M. C. Z. 48482) measures 2087 (1592 + 495) mm.; the largest ♀ (M. C. Z. 48484) only 1977 (1520 + 457) mm., though when freshly killed this same snake measured 2052 (1580 + 472) mm. Eight of the series are over six feet in length.

Breeding. On February 22, small ova were present in the largest of the Idjwi females; evidently it was not their breeding season.

Diet. In addition to unidentifiable rodent remains, the following

rats and mice were recovered from the stomachs of six of the Idjwi snakes: (1) one *Rattus r. kijabius;* (2) six half-grown *Praomys j. montis;* (3) two *Leggada g. grata;* (4) four new-born *Lophuromys a. laticeps;* (5) two *Lophuromys a laticeps;* (6) an adult *Dasymys b. medius.*

Parasites. Nematodes (*Kaliecephalus sp.*) in an Idjwi snake.

Enemies. The Mabira ♂ was killed on the road by a native. The six-and-three-quarter-foot ♀ by a woman who said that it chased a rat from the forest into her hut; a third very large example was also killed by a woman, but in the bush.

VIPERIDAE

Causus rhombeatus (Lichtenstein)

Sepedon rhombeatus Lichtenstein, 1823, Verz. Doubl. Mus. Berlin, p. 106: No locality.

3 ♂ ♂ 1 ♀ (M. C. Z. 47837) Gulu, Acholi, U. iv–viii.38.(C.R.S.P.).
2 ♀ ♀ (M. C. Z. 47838) Lira, Lango, U. iv–viii.38. (C.R.S.P.).
2 ♂ ♂ (M. C. Z. 44117) Ugano, Matengo, T. T. 1935–6. (H. Zerny).

Distribution. I am indebted to Lt. Col. Pitman for the Uganda specimens; it seems strange that I did not encounter this common night adder during the eight months of my *safari,* good testimony to the fact that this species is not a forest-dweller.

Variation. Midbody scale-rows 17–19; ventrals 147–155; anal entire; subcaudals 19–29 pairs; labials 6.

Causus resimus (Peters)

Heterophis resimus Peters, 1862, Monatsb. Akad. Wiss. Berlin, p. 277, pl. —, fig. 4: Gebel Ghule, Sennar, Anglo-Egyptian Sudan.

♂ ♀ (M. C. Z. 48492–3) Nyakabande, U. 27.i.39.

Variation. Midbody scale-rows 21; ventrals 134–145; anal entire; subcaudals 20–22 pairs; labials 6.

Measurements. The ♂ measures 491 (450 + 41) mm.; ♀ measures 220 (200 + 20) mm.

Breeding. On January 27, 6 eggs measuring 36 x 16 mm. in the ♀.

Diet. A young toad (*Bufo r. regularis*) in her stomach.

Causus defilippii (Jan)

Heterodon De Filippii Jan, 1862, Arch. Zool. Anat. Fisiol., **2**, p. 225: Africa.

2 ♂ ♂ 2 ♀ ♀ (M. C. Z. 48494–6) Mikindani, T. T. 12.iv.39.
♀ (M. C. Z. 48497) Mbanja, Lindi, T. T. 1.v.39.
2 ♂ ♂ 2 ♀ ♀ (M. C. Z. 48498–501) Nchingidi, T. T. 13.v.39.

Distribution. Add Amboni Estate, near Tanga, T. T. 24. vi. 39.

Native names. Chipili (Kimawiha); *lipili* (Kimakonde). Neither distinguishing it from the Puff Adder (*Bitis arietans*).

Variation. Midbody scale-rows 16 (M. C. Z. 48494 only) or 17; ventrals 112–122; anal entire; subcaudals 13–15 pairs; labials 6.

Measurements. Largest, a ♀ (Field Museum), measures 412 (382 + 30) mm.; all the others were under 270 mm. in total length.

Enemies. One recovered from stomach of eagle (*Circaëtus cinereus*) at Amboni.

Causus lichtensteinii (Jan)

Heterodon Lichtensteinii Jan, 1859, Revue Mag. Zool., p. 511: Gold Coast.

♂ ♀ (M. C. Z. 48502–3) Mabira Forest, U. 19.xi.38.
2 ♂ ♂ 2 ♀ ♀ (M. C. Z. 48504–7) Budongo Forest, U. 22–30.xi.38.
♀ (M. C. Z. 48508) Kibale Forest, U. 9.xii.38.

Variation. Midbody scale-rows 15; ventrals 136–147; anal entire; subcaudals 16–21 pairs; labials 6.

Measurements. Largest ♂ (M. C. Z. 48504) measures 598 (540 + 58) mm.; largest ♀ (M. C. Z. 48503) measures 549 (507 + 42) mm.

Breeding. At Mubango, on November 19, 6 eggs measuring 15 x 9 mm. in ♀; at Bisu, Budongo, on November 30, 8 eggs measuring 10 x 5 mm. in ♀; at Kibale Forest, on December 12, 4 eggs measuring 17 x 6 mm. in ♀.

Parasites. Nematodes (*Ophidascaris sp.* and *Proteocephalus sp.*) in a Budongo snake.

Temperament. Our tent boy disturbed two of these velvety-green night adders on the path between our fire and tent. When I reached the spot the two snakes were returning from the rank vegetation bordering the path. The anterior third of each was raised high, and so flattened that for a second I thought that they were young cobras. They were almost intertwined, their lower portions so close together that I pinned both down with my T-ended stick. At this, one reptile began to bite savagely at the other's neck, enabling me to seize both together by their necks with the forceps. I supposed it was a court-

ship performance that I had interrupted, but on examination, after anaesthetization, found both were males (M. C. Z 48504–5) which were presumably fighting.

Bitis arietans (Merrem)

Vipera arietans Merrem, 1820, Vers. Syst. Amphib., p. 152: Cape of Good Hope.

♂ (M. C. Z. 48509) Budongo Forest, U. 6.xii.38.
♀ (M. C. Z. 48510) Idjwi Island, B. C. 3.iii.39.
♀ (M. C. Z. 48511) Ujiji, T. T. 13.iii.39.
♂ (M. C. Z. 48512) Kitaya, T. T. 31.iii.39.
♂ (M. C. Z. 48513) Mikindani, T. T. 16.iv.39.
♂ (M. C. Z. 48514) Siga Caves, T. T. 8.vi.39.

Native names. Viserosero (Lulega); *lipili* (Yao and Kimakonde); *chipili* (Kimawiha). The last two names are applied to *Causus* also.

Variation. Midbody scale-rows 31–34; ventrals 133–141; anal entire; subcaudals 13–33; labials 12–14.

Measurements. The entire series are juvenile, the smallest (M. C. Z 48514) measures only 209 (185 + 24) mm.

Habitat. At Siga I shot a wood hoopoe in a tree overhanging the path leading to my tent; as my gunbearer stooped to pick up the dead bird, which had fallen on the leaf-strewn path, he paused, for right beside it was the young puff adder.

Bitis gabonica (Duméril & Bibron)

Plate 3, fig. 2.

Echidna Gabonica Duméril & Bibron, 1854, Erpét. Gén., **7**, p. 1428, pl. lxxx b: Gaboon.

♀ (M. C. Z. 48415) Budongo Forest, U. 26.xi.38.
♂ ♀ (M. C. Z. 48416) Nchingidi, T. T. 12.v.39.
1 ♂ 2 ♀ ♀ (M. C. Z. 48417) Magrotto Mtn., T. T. 1–9.vii.39.

Distribution. An even more southeasterly record in Tanganyika Territory than Nchingidi, Rondo Plateau, is that of Lulindi, where, according to Dr. L. Stirling of the U. M. C. A., it occurs in a patch of forest at an altitude not much over a thousand feet.

Native name. Moma (Kisambara).

Variation. Midbody scale-rows 38–43; ventrals 128–140; anal entire; subcaudals 20–26; labials 14–16.

Measurements. One ♂ measures 1155 (1010 + 145) mm.; largest ♀ measures 1311 (1225 + 86) mm.; both from Magrotto. This 4 foot 5 inch ♀ is, however, easily surpassed by one of 5 feet 8½ inches which Lt. Col. Pitman informs me (17.xi.34) he obtained in the Mabira Forest.

It is interesting to note the difference between the measurements of freshly killed Magrotto snakes and that of their dried skins though care was taken not to stretch the latter unduly.

♂	measured	1155 mm. in the flesh,	its dried	skin	1300 mm.
♀	"	1162 mm.	"	"	1210 mm.
♀	"	1311 mm.	"	"	1560 mm.

Weights. A 3 foot 9¼ inch ♂ weighed 4 lbs.; its stomach being empty.
3 foot 9⅞ inch ♀ weighed 5 lbs.; stomach held 4 rats.
4 foot 3 inch ♀ weighed 8 lbs.; stomach held 2 rats.
4 foot 5 inch ♀ weighed 11 lb.; stomach held 1 rat, and oviducts eggs as listed below.

Breeding. At Magrotto, on July 1, 43 eggs, of which the largest measured 35 x 24 mm., in a ♀. No other ♀ ♀ taken were gravid.

Diet. Four house rats (*Rattus r. kijabius*) in Budongo and Magrotto snakes, three field rats (*Mastomys c. durumae*) in a Magrotto snake.

Parasites. Nematodes (*Ophidascaris sp. and Kalicephalus sp.*) numerous in Budongo snakes, a rodent thread worm (*Mastophorus m. muris*) and porocephalid larva in a Magrotto snake.

Defence. Mr. W. E. Hartmann, formerly engaged in making zoological collections for a Swiss museum, told me how in the eastern Usambaras he had once found himself standing beside one of these huge vipers which he had not noticed, though he had been standing some little time. Having a spike-ended stick in his hand, he drove the point down through the snake's neck close behind the head, transfixing it to the ground. Thereupon the snake opened its mouth three times and each time two jets of venom issued from the fangs and were projected to a distance of a foot or two. They were not directed at Mr. Hartmann, however, for he was standing beside, and somewhat behind, the head.

This species produces so much venom that the cloudy white liquid dripped from one's fangs as I pushed back the *vagina dentis* to show the teeth to Fimbu, a headman on Magrotto Estate, who had lost an arm through the bite of one of these snakes. Fimbu told me that he had retired to his hut for several days after being bitten, and was treated with native medicines. His arm, however, 'went bad' and was amputated by a mission doctor.

Elsewhere I (1940a, p. 502) have described the sluggishness of one of these big snakes on a hot afternoon. Secure in its camouflage, it remained motionless while search was being conducted in close proximity, nor even when first picked up did it attempt to struggle or strike.

Bitis nasicornis (Shaw)

Coluber Nasicornis Shaw, 1802, Nat. Miscell., **3**, pl. xciv: Interior of Africa (from the master of a Guinea vessel).

♂ ♀ (M. C. Z. 48518–9) Mabira Forest, U. 8.xi.38.
3 ♂ ♂ (M. C. Z. 48520–1) Bundibugyo, U. 21.xii.38.
4 ♂ ♂ 3 ♀ ♀ (M. C. Z. 48522–3) Idjwi Id., B. C. 17–28.ii.39.

Native names. Salambwa (Luganda); *mpoma* (Lutoro); *heli* (Luamba); *mpili* or *mpiri* (Lulega).

Variation. Midbody scale-rows 29–40; ventrals 118–131; anal entire; subcaudals 19–30; labials 15–19.

Coloration. Males, irrespective of size, have bellies which are marbled and mottled like those of the females.

Measurements. Largest ♂ measures 824 (710 + 114) mm.; largest ♀ only 875 (805 + 70) mm., both from Idjwi Island.

Breeding. Females non-gravid in both November and February.

Diet. Three house rats (*Rattus r. kijabius*) in Mabira and Idjwi snakes, a rat (*Lophuromys a. laticeps*) in other Mabira viper; rodent fur in two other Idjwi reptiles.

Atheris squamigera squamigera (Hallowell)

Echis squamigera Hallowell, 1854, Proc. Acad. Nat. Sci. Philadelphia, p. **193**: Near the Gaboon River, Guinea, *i.e.* French Congo.

4 (M. C. Z. 48524–6) Mabira Forest, U. 12.xi.38.

Variation. Midbody scale-rows 19–22; ventrals 154–161; anal entire; labials 9–12.

Measurements. Largest ♂ measures 537 (445 + 92) mm., but the other two are only one or two mm. shorter; ♀ measures 655 (555 + 100) mm.

Diet. A pigmy mouse (*Leggada sp.*) in one, unidentifiable rodent fur in another.

Parasites. Ticks (*Aponomma falsolaeve*) were present on one of these vipers.

ATHERIS NITSCHEI NITSCHEI Tornier
Plate 3, fig. 3.

Atheris nitschei Tornier, 1902, Zool. Jahrb. Syst., **15**, p. 589, fig.: Mpororo Swamp, southwest Uganda.

Atheris woosnami Boulenger, 1906, Ann. Mag. Nat. Hist. (7), **18**, p. 37: Mubuku Valley, Mount Ruwenzori, Uganda.

5 (M. C. Z. 48527–30) Mihunga swamp, U. 13–18.xi.38.
1 (M. C. Z. 48531) Nyakabande, Ruanda, U. 28.i.39.
4 (M. C. Z. 48532–5) Mushongero, Ruanda, U. 1.ii.39.
22 (M. C. Z. 48536–50) Idjwi Id., B. C. 17–28.ii.39.

Native names. *Nchia* (Lukonja); *wahimberi* (Lutoro); *chirazi* or *kirazi* (Lulega).

Taxonomy. The first five specimens are topotypes of *woosnami* as the swamp is in the Mubuku Valley immediately below Woosnam's camp on the Mihunga ridge. The next five snakes must be near topotypes of *nitschei* according to the location of Mpororo district in Steiler's atlas, though I have failed to locate any particular swamp to which the name is especially applied.

The series from Lake Kivu are somewhat intermediate between the Uganda material and the snake from Tanganyika Territory recently described by Bogert (1940, p. 104) as *A. n. rungweensis*, and which may be distinguished by the strongly keeled gulars. This additional material reveals that the other characters cited by Bogert are not constant enough to be dependable, though the fact that there is a definite trend for increased head scales as between the Uganda snakes and those from the Congo, makes it appear possible that when more material of the southern form is available an average difference will be demonstrable.

With the object of emphasizing this trend in lepidosis, the scale-counts of the Uganda (U) snakes are separated from those of the Congo (C) as follows.

Variation. Midbody scale-rows 27–29 (U), 25–33 (C); ventrals 142–162 (U), 150–162 (C); anal entire; subcaudals 38–51 (U), 44–51 (C); labials 9–12 (U), 10–13 (C); interorbital scales across crown 8–12 (U), 9–13 (C); circumorbital scales 12–16 (U), 13–17 (C); scales between eye and nasal 2–4 (U), 3–5 (C); scales between mental and first ventral 5–7 (U. & C).

The type of *rungweensis* had 12 supralabials, a condition found on

one or both sides of the head in seven of the above series; *rungweensis* had 13 interorbital scales, as have six of these snakes; *rungweensis* had 4 scales between eye and nasal, as have three snakes but eighteen more have 3 scales in the upper row and 4 in the lower; *rungweensis* had 7–8 scales between mental and first ventral, three snakes in my series have 7.

Coloration. In life. ♀ (M. C. Z. 48528) Above, pale yellowish green, a conspicuous black arrow-head marking on crown, an obsolescent vertebral line, becoming more definite on posterior third of body and on tail where it is almost zigzag, is flanked along its entire length by black diamond-shaped or triangular spots; a black line from end of snout through orbit. Below, uniform greenish yellow except on tail which has an ill-defined, dark olivaceous, median line that broadens on tip to cover the entire under surface.

♂ like the ♀ but with dusky streak along entire length of belly.

Measurements. Largest ♂ (M. C. Z. 48537) measures 672 (555 + 117) mm.; largest ♀ (Congo Mus.) measures 646 (555 + 91) mm.; smallest snake, a ♂ (M. C. Z. 48535), measures 204 (172 + 32) mm.

It should be noted, however, that there is a considerable shrinkage between specimens measured in the field and later as alcoholics. Thus the beautiful pair captured at Mihunga, as described below, measured respectively ♂ 623 (520 + 103) mm. in the field, 605 (505 + 100) mm. in alcohol, while the ♀ was 620 (532 + 88) mm. in the field, and 619 (537 + 82) mm. in alcohol.

Breeding. On January 18 this ♀ held 9 embryos, of which a ♂ measured 60 (50 + 10) mm. No other females were gravid.

Diet. Pigmy mice (*Leggada g. grata*) in stomachs of snakes from Mihunga swamp and Idjwi Island; a shrew (*Crocidura ? h. hildegardae*) in another of the island vipers.

Parasites. The Mushongero adult was heavily infested with tapeworms (*Ophiotaenia sp.*) and nematodes (*Ophidscarus sp.*), while the stomachs of many Idjwi snakes were similarly parasitized as well as with *Capillaria sp.* and *Kaliecephalus sp.*

Habitat. In the late afternoon, (one was taken sunning at 4 p.m., the other at 5 p.m. or three quarters of an hour after the sun had dropped behind the upper Mihunga ridge,) I caught a pair of fine adults as they lay coiled like plates on the top of dense tangles of creepers which smothered the elephant grass growing along the banks of the little stream which meanders through the swamp. Both reptiles were at a height of six feet or more from the ground and I was able to seize each of them by the neck with forceps without trouble.

When I transferred them from the forceps to my fingers they gaped widely and raised their long fangs.

At Mushongero, where there is little, if any, elephant grass, these vipers live in enormous beds of papyrus.

Though 'tree viper' is something of a misnomer, and I do not regard them as sylvicoline, I was following a path through heavy forest on Idjwi Island when my gunbearer remarked in the vernacular "You are not interested in collecting snakes then?" Turning at this sarcastic shaft, I saw him regarding one of these vipers. The snake, at a height of three feet from the ground, was ensconced in a shrub that I had just passed, in fact I must almost have brushed against it; a bar of sunlight striking down through a rift in the forest canopy, illuminated the spot.

Apparently then, the requirements of these vipers — apart from small mice and frogs — is a moist or humid habitat with vegetation in which they can climb. Such conditions may be found on the edges of lakes, in swamps, or on the outskirts of virgin forest.

Atractaspis irregularis (Reinhardt)

Elaps irregularis Reinhardt, 1843. Dansk. Vidensk. Selsk. Skrift., **10**, p. 264, pl. iii, figs. 1–3: Gaboon.

Atractaspis schoutedeni Witte, 1930, Revue Zool. Bot. Africaine, **19**, p. 224, figs. 1–3: N'Goma, north of Lake Kivu, Belgian Congo.

♂ (M. C. Z. 48551) Mabira Forest, U. 12.xi.38.
♀ (M. C. Z. 48552) Budongo Forest, U. 1.xii.38.
♂ ♀ (M. C. Z. 48553–4) Bundibugyo, U. 24.xii.38.
♂ (M. C. Z. 48555) Goma, B. C. 13.ii.39.

Synonymy. *A. schoutedeni* was based on a single specimen which its author stated differed only from *irregularis* in (1) Its frontal being longer than broad, instead of as long as broad. Actually both conditions are common in *irregularis*, the frontal being longer than broad in the Budongo, one Bundibugyo, and the Goma snake listed above. (2) The first lower labials are just separated, instead of being broadly in contact, behind the mental.

I consider this to be an individual aberration in the type of *schoutedeni*, and, as *irregularis* occurs in the same locality, cannot recognize a species based on a single character. See also remarks on *katangae* below.

Variation. Midbody scale-rows 23–25; ventrals 219–252; anal divided; subcaudals 22–27, paired; labials 5, the third and fourth enter-

ing the orbit; first lower labial in contact with its fellow behind the mental.

Measurements. Largest ♂ (M. C. Z. 48551) measures 457 (425 + 32) mm.; larger ♀ (M. C. Z. 48552) measures 656 (621 + 35) mm.

Atractaspis bibronii Smith

Atractaspis bibronii A. Smith, 1849, Illus. Zool. S. Africa, Rept., pl. lxxi: Eastern districts of Cape Colony.

Atractaspis katangae Boulenger, 1901, Ann. Mus. Congo, Zool., **2**, p. 13, pl. v, figs. 2–2c: Lofoi, Katanga, Belgian Congo.

2 ♂ ♂ (M. C. Z. 48557–8) Ujiji, T. T. 13.iii.39.
3 ♂ ♂ 4 ♀ ♀ (M. C. Z. 48559–65) Mbanja, T. T. 27–30.iv.39.
♀ (M. C. Z. 48560) Nchingidi, T. T. 13.v.39.
♀ var. (M. C. Z. 48556) Amboni Estate, T. T. 21.vi.39.

Native name. *Mbitu* (Kimakonde at Mbanja, but applied to any limbless burrowing reptile.

Synonymy. *A. katangae* was based on a single juvenile specimen which its author compared with *aterrima*, considering its snout rounded, instead of cuneiform, a point often difficult to decide, particularly in the young. During the forty years since its description, four further examples have been recorded, viz. Katanga (Witte, 1930i); Msamwia, Ufipa, T. T. (Sternfeld, 1910a); and Elisabethville, Katanga (Witte, 1933m).

One of the latter (now M. C. Z. 42978), a juvenile ♀, has been carefully studied and its snout, like that of the Amboni snake listed above, is cuneiform, differing quite noticeably from that of the Uluguru *aterrima* in the collection of the M. C. Z. (23466).

The only other ways in which *katangae* allegedly differs from *bibronii*, within whose range it occurs, is (1) Midbody scale-rows 25, instead of 21–23, but our Elisabethville snake has 23 which is the normal number in tropical Africa. As most other well-known species of the genus *Atractaspis* have a range of two more or two less than the normal number, this minor difference should carry little weight. (2) The posterior point of the mental is in contact with the anterior sublinguals, thus separating the first labials. Now that a snake (M. C. Z. 48556) with this condition has turned up at Amboni, near Tanga on the East Coast, it does not seem unreasonable to assume that it is an individual aberration (*cf. irregularis + schoutedeni* above) of which there is a marked strain in the Katanga region, but insufficiently numerous to be regarded as a race, surrounded as they are by typical *bibronii*.

For the convenience of those who may entertain doubts, however, I have separated the data below.

Variation. bibronii type (M. C. Z. 48557–60). Midbody scale-rows 21–23; ventrals 224–252; anal entire; subcaudals 17–26, single; labials 5, the third and fourth entering the orbit; first lower labial broadly in contact with its fellow behind the mental.

A. katangae type (M. C. Z. 48556). Midbody scale-rows 23; ventrals 259; anal entire; subcaudals 23, single; labials 5, the third and fourth entering the orbit; first lower labial well separated from its fellow by the mental which is in contact with the sublinguals.

Measurements. Largest ♂ (M. C. Z. 48557) measures 429 (397 + 32) mm.; largest ♀ (M. C. Z. 48556) measures 504 (476 + 28) mm.

Diet. At Mbanja a naked nestling shrew (*Crocidura h. hirta*) was recovered from one, three large and one small nestling mice (*Leggada b. vicina*) in another.

Habitat. I caught the largest male under rotting vegetation in a banana plantation at Ujiji. Kizamba unearthed the Nchingidi snake in forest close to camp, and, under the supposition that it was harmless, grabbed its head in his hand and so carried it back to camp. I captured the largest female when she was turned up by the tractor engaged in spreading piles of rotting vegetation in a cleared sisal plantation at Amboni.

GEKKONIDAE

Cnemaspis quattuorseriatus (Sternfeld)

Gonatodes quattuorseriatus Sternfeld, 1912, Wiss. Ergeb. Deut. Zentral-Africa-Exped. 1907–1908, **4**, p. 202, pl. vi. fig. 1: Rugege Forest and Kisenyi, Lake Kivu, Belgian Ruanda-Urundi; Uvira, Lake Tanganyika, Belgian Congo.

♂ (M. C. Z. 47305) Kibale Forest, U. 17.xii.38.
Eggs (M. C. Z. 47306) Idjwi Island, B. C. 3.iii.39.

Remarks. To some extent this Kibale gecko bridges the narrow gap which separates *quattuorseriatus* from *dickersoni* (Schmidt) of the northeastern Belgian Congo, which Bogert tells me cannot be regarded as even subspecifically distinct.

Variation. Within the known range of variation except for having (1) 7 lower labials on right side of head, (2) the upper, or dorso-lateral, row of tubercles is almost non-existent, being represented only by one or two scattered tubercles, (3) 6 preanal pores.

Measurements. ♂ measures 66 (31 + 35) mm. A hatchling only 27 (14 + 13) mm.

Breeding. On March 3, on Idjwi Island, a dozen eggs measuring 7 x 6 mm., were found in crevices of bark and among debris at the foot of two large trees. The eggs contained embryos, one egg which hatched resulted in the little gecko whose measurements are given above.

Habitat. The male was taken just before sunset as it was running up a tree trunk. Intensive search at Kibale and on the Upper Mulinga failed to discover any more of these elusive geckos.

Cnemaspis africanus elgonensis Loveridge

Cnemaspis africanus elgonensis Loveridge, 1936 (1935), Proc. Zool. Soc. London, p. 820: Above Sipi, w. slopes of Mount Elgon, Uganda.

♀ & eggs (M. C. Z. 47304) Mubuku Valley, U. 7.i.39.

Distribution. This constitutes the first record of the occurrence of this species on the Ruwenzori Mountains and, at the same time, forms a westerly extension of its range.

Correction. In the diagnosis of this species (*loc. cit.*) I made the stupid mistake of transposing the number of preanal pores of *africanus* to *elgonensis* and *vice versa*. The present individual, being a poreless ♀, cannot be determined on this important characteristic of the race.

Variation. It agrees with the typical form, *a. africanus,* in having (1) a single granule between the supranasals, (2) in having five granules in addition to the rostral surrounding the nostril, (3) 8 upper labials. None of these characters is of importance except the first, which was found to vary even in the type series.

Measurements. ♀ measures 120 (56 + 64) mm.

Breeding. Between January 1 and 7, we unearthed more than a dozen eggs, each measuring about 11 x 9.5 mm.

Habitat. This gecko is exceedingly scarce, or difficult to find, in the Ruwenzori forests. As I devoted so much time to its acquisition, it might be of interest to publish the details. Shortly after our arrival in the Mubuku Valley we started digging about the bases of the larger trees and unearthed three pairs of *Cnemaspis* eggs around the bole of the largest, a gigantic old tree with some holes at its base and hollow branches visible at a height of twenty feet from the ground. On subsequent days we found four more pairs of eggs at the base of as many trees of which we thoroughly excavated round about a hundred. A special reward of ten cents was offered for the first specimen which

should be captured, but during the whole week only one was sighted and it contrived to slip into a hole and escape.

Night after night I visited the big tree with a flashlight and scanned its trunk as well as those of many others. Morning after morning, during the few hours of sunshine vouchsafed to us, we examined trunks in case geckos had been tempted to descend to sun themselves. We constructed a twelve-foot ladder with four-foot subsidiary, but failed to reach the two hollow branches of the big tree, then we felled a tree against the giant and Kizamba, our most accomplished climber, ascended and chopped open the hollow branch, but all to no purpose.

Our last morning for collecting dawned after a torrential downpour the previous evening. Kizamba, on his own initiative, went to inspect the big tree upon whose trunk a shaft of sunlight was playing, illuminating a fissure which was five feet from the ground. On the edge of this fissure he glimpsed a gravid female basking; she promptly vanished into the crevice, but he was successful in extracting her!

Cnemaspis africanus africanus (Werner)

Gymnodactylus africanus Werner, 1895, Verh. Zool. Bot. Ges. Wien, **45**, p. 190, pl. v, fig. 5: Usambara Mountains, Tanganyika Territory.

2 ♂ ♂ 2 ♀ ♀ & eggs (M. C. Z. 47301–3) Magrotto Mtn., T. T. 5.vii.39.

Distribution. Also a tail of one of these geckos from the Siga Caves. These caves, on the banks of the Mkulumuzi River, are surrounded by gallery forest which has suffered considerably. The presence of this sylvicoline gecko in the lowlands helps to harmonize the earlier German records of its occurrence at Tanga (M. C. Z. 21918) Kuettner leg.

Correction. In my revision of this genus, I (1936a, p. 818) made the foolish mistake in the diagnostic key of switching the number of preanal pores of *C. a. africanus* with those of its subspecies *elgonensis*.

Variation. These fall within the range given in the redescription of *africanus* cited above.

Coloration. In life. ♂. Above, olive green mottled with brown and black. Below, throat white, belly, base of tail, thighs, groin, and anterior aspect of tibia, chrome.

Breeding. On July 5, a ♀, together with one egg, measuring 9.5 x 7.5 mm., and evidently just laid, were found beneath a log. Two fresh eggs, measuring 9 x 7.5 mm. were dug from a hole at the base of a tree. Unfortunately one hatched on the journey to the States and the gecko is too dried to measure. In all a score of eggs were collected.

Habitat. I observed a ♂ basking at 9 a.m. where a beam of sunlight was striking through the canopy into the interior of a partially decayed tree in the forest beside the river. The gecko immediately descended, disappearing into a hole among the roots, from this I dug it together with the two eggs mentioned above.

At Siga Caves I saw a gecko basking at edge of a crevice in the cliff face. I fired at it from afar so as not to damage it. The lizard, however, discarding its tail, disappeared into the fissure, from which it could not be retrieved.

HEMIDACTYLUS TROPIDOLEPIS BARBOURI subspec. nov.

Hemidactylus tropidolepis Andersson (not Mocquard), 1912, Jahrb. Nassau. Ver. Naturk. Wiesbaden, **65**, p. 227, figs. 1–4 (Tanga). Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 142 (Kilindini).

Hemidactylus tropidolepis squamulatus Loveridge (not Tornier), 1933, Bull. Mus. Comp. Zoöl., **74**, p. 284 (Kilindini), and *idem* **79**, p. 287 (Changamwe).

5 (M. C. Z. 47320–2) Siga Caves, Tanga, T. T. 13.vi.39.
7 (M. C. Z. 47323–8) Opposite Kilindini, K. C. 25.vii.39.

Type. Museum of Comparative Zoölogy, No. 40907, an adult ♀ from Changamwe, near Mombasa, Kenya Colony, collected by Arthur Loveridge, July 4, 1934

Paratypes. Museum of Comparative Zoölogy, Nos. 24649–50 and 30447, from Likoni on mainland opposite Kilindini, Mombasa, and the material listed above.

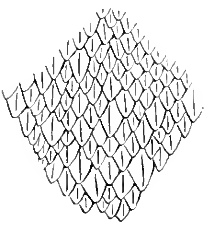
History. Andersson (1912) with scanty material, decided to merge *tropidolepis* (Somaliland), *floweri* (Sudan), *squamulatus* (Kenya and Tanganyika) together with a Tanga gecko which he regarded as intermediate in certain respects. Barbour & Loveridge (1928) with two geckos from Likoni opposite Kilindini and no *tropidolepis* material, accepted Andersson's conclusions. Later, realizing the distinctness of the southern gecko, I (1933, 1936) erroneously applied Tornier's name *squamulatus* to two further specimens.

One of the principal objectives of my recent visit to Tanga was to obtain an adequate series of Andersson's gecko. Now, with Kenya examples of all three—*tropidolepis*, *squamulatus* and the Tanga form, it is necessary to describe the latter and I take pleasure in naming it for Dr. Thomas Barbour, who has so generously furthered these studies of African herpetofauna.

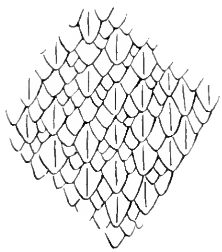
Diagnosis. It belongs to that section of the genus characterized by the possession of imbricate scales, instead of granules or tubercles on the dorsum. From its nearest allies it may be differentiated as follows:

Character	*H. t. tropidolepis*	*H. t. squamulatus*	*H. t. barbouri*
Dorsal scales	Considerable disparity in size. Both large and small keeled.	Great disparity in size. Only largest strongly keeled.	Little disparity in size. Only largest feebly keeled.
Median subcaudal scales	Slightly enlarged transversely.	Moderately enlarged transversely.	Strongly enlarged transversely.
Male pores	6–8	10–20	16–23
Snout to anus	37 mm.	48 mm.	44 mm.

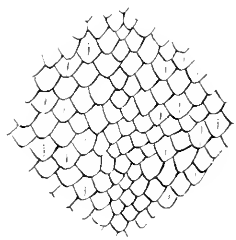
The keeling, quite apart from other characters, distinguishes *barbouri* from *homoeolepis, ophiolepis, isolepis* and the so-called *Bunocnemis modestus.*



H. t. tropidolepis
Dorsal lepidosis of Type from Somaliland (after Angel, 1925)



H. t. squamulatus
Dorsal lepidosis of Type of *alluaudi* from Kenya Colony (after Angel, 1925)



H. t. barbouri
Dorsal lepidosis of Type from Kenya Colony (M. C. Z. 40907—♀)

Description. (Figures in parenthesis are those of the sixteen paratypes, though in none of them does *barbouri* differ from *tropidolepis* or *squamulatus,* the latter including *werneri, tornieri* and *alluaudi*).

Nostril bordered by the rostral, first labial, and (3–) 4 small nasals, the uppermost in contact with its fellow (or separated by a single granule in M. C. Z. 47320 only); upper labials 7–8 (6 in three paratypes, see fig. 1 in Andersson); lower labials 6–7 (5 in two paratypes); digits moderately dilated, inferiorly with oblique lamellae, 5 (4–6) under the first toe, 7 (6–8) under the fourth toe (see fig. 2 in Andersson; owing to

the gradual diminution in size of enlarged lamellar-like shields, counting becomes somewhat arbitrary and on some individuals might be reckoned up to 10 or 11).

Back covered with heterogeneous, imbricate scales, the largest of which are feebly keeled; tail covered above and below by smooth, imbricate scales, of which the median subcaudal series are transversely enlarged, resembling the ventrals of ophidia. (Males with 16–23 preano-femoral pores).

Measurements. Total length of type ♀, 84 (44 + 40) mm., largest paratype ♂, 70+ (38 + 32+) mm., the tail being regenerated.

Habitat. All were taken beneath the great piles of palm fronds assembled in the coconut plantations, the Siga series within a hundred yards of my tent, those from opposite Kilindini within a mile of the ferry landing at Likoni.

Hemidactylus mabouia (Jonnés)

Gecko mabouia Moreau de Jonnés, 1818, Bull. Soc. Philom. Paris, p. 138: Antilles and adjacent mainland.

Hemidactylus tasmani Hewitt, 1932, Ann. Natal Mus., **7**, p. 120: Gwelo, Southern Rhodesia.

1 (M. C. Z. 47318) Uvira, B. C. 7.iii.39.
2 (M. C. Z. 47307) Ujiji, T. T. 10.iii.39.
Eggs & 4 (M. C. Z. 47308) Kitaya, T. T. 25.iii.39.
2 (M. C. Z. 47309) Mikindani, T. T. 11.iv.39.
2 (M. C. Z. 47311) Nchingidi, T. T. 9.v.39.
1 (M. C. Z. 47312) Lindi, T. T. 1.vi.39.
1 (M. C. Z. 47313) Siga Caves, T. T. 25.vii.39.

Distribution. Common on the screening of Jinja Hotel, Uganda; seen also at Magrotto, T. T.

Native names. Nanguagua (Kimawiha); the common Swahili name of *mjusi* (lizard) is used for this gecko by Wamakonde and Wayao.

Synonymy. H. mabouia has usually been described as having "round" or "conical" tubercles, and this has led Dr. Hewitt to conclude that his pair of Gwelo geckos with distinctly keeled tubercles are distinct. As a matter of fact the tubercles of our extensive Antillean material frequently exhibit well defined keels and striae and neither Mr. Shreve nor I can distinguish between this topotypic material and our Southern Rhodesian (Birchenough Bridge, Sabi River) specimens in this character which shows considerable variation throughout its range. The fact that *tasmani* has 8 subdigital lamellae beneath its

median toe, together with its large size of 142 (69 + 73) mm., preclude the possibility of its being identified with the so closely allied *gardineri*.

Measurements. Largest ♂ (M. C. Z. 47311) measures 83 mm. from snout to anus; tail regenerated.

Breeding. On March 3, at Kitaya, three pairs of eggs, measuring 11 mm. in diameter, were taken in grass and under a collapsed hut; others at Mikindani on March 23.

Enemies. Adult, with tail intact, recovered from the stomach of a half-grown house snake (*Boaedon l. lineatus*) at Kitaya; one from a spotted wood snake (*Philothamnus s. semivariegatus*) at Kitaya, and one from a white-lipped snake (*Crotaphopeltis h. hotamboeia*) at Ujiji.

Habitat. The huge male was sunning on a forest tree in an overgrown clearing of the Rondo Plateau forest, far from the haunts of man! These clearings, however, were made by natives who fled up to the plateau during the war of 1914–1918. They were removed in the interests of forest conservation about 1920. The geckos were doubtless introduced in bundles of thatching material. Ujiji specimens were taken in abandoned tannery or refinery vats.

HEMIDACTYLUS GARDINERI Boulenger

Hemidactylus gardineri Boulenger, 1909, Trans. Linn. Soc. London (2), **12**, p. 296, pl. xl, fig. 4: Farquhar Island, Seychelle Islands.

Hemidactylus persimilis Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 140, pl. iv, figs. 1 and 3: Dar es Salaam, Tanganyika Territory.

Hemidactylus mandanus Loveridge, 1936, Proc. Biol. Soc. Washington, **49**, p. 60: Kitau, Manda Island, Kenya Colony.

1 (M. C. Z. 47310) Mbanja near Lindi, T. T. 1.v.39.
1 (M. C. Z. 47319) Nchingidi, Rondo, T. T. 9.v.39.
5 (M. C. Z. 47314) Siga Caves, Tanga, T. T. 13.vi.39.
6 (M. C. Z. 47315) Amboni Estate, T. T. 19.vi.39.
4 (M. C. Z. 47316) Tanga, T. T. 22.vii.39.
1 (M. C. Z. 47317) Opp. Kilindini, K. C. 25.vii.39.

Synonymy. H. gardineri has never before been recorded from the African mainland; indeed, except for Boulenger (1911d) noting its occurrence in five localities of the Aldabra Islands, it has not appeared in the literature, being omitted by Parker (1936b) from his revised list of the Seychellois herpetofauna. When Barbour and I described *persimilis* we discussed the possibility of its identity with *gardineri*, but with no specimen of the latter available, we ruled it out as improbable.

Since then we obtained by exchange a ♀ cotype (M. C. Z. 28652), and from the Berlin Museum one of the Seychelle geckos referred by Peters (1869a) to *maculatus*. This specimen is specifically identical with *gardineri* and is not *maculatus* Duméril & Bibron as now restricted to their Indian material. The types of *persimilis* and *mandanus* have also been compared with the cotype of *gardineri* and found to be indistinguishable, for the minor differences displayed by *mandanus* are within the range of variation displayed by fifty specimens from nineteen localities which have been individually examined for the purpose of a revision of the family.

Breeding. On March 23, at Mikindani, several eggs measuring 8 x 7 mm., presumably of this species, were found under palm fronds.

Habitat. The series (M. C. Z. 47314–7), like the young geckos, with tails conspicuously barred black and white on a pinkish ground, from Lamu and Mombasa Islands captured in 1934, were taken, without exception, from beneath piles of fronds of the coconut palm. When such piles were in the vicinity of a palm, each gecko, as soon as disturbed, would make a dash for the nearest trunk, dart round to its further side and so upwards to safety.

Enemies. One was recovered from the stomach of a spotted wood snake (*Philothamnus s. semivariegatus*) at Mbanja, another from a smooth snake (*Meizodon semiornata*) at Amboni, near Tanga.

LYGODACTYLUS GROTEI GROTEI Sternfeld

Lygodactylus grotei Sternfeld, 1911, Sitz. Ges. Naturf. Freunde Berlin, p. 245: Mikindani, Lindi Province, Tanganyika Territory.

2 (M. C. Z. 47329) Ujiji, T. T. 11.iii.39.
11 (M. C. Z. 47330) Kitaya, T. T. 15.iii.39.
3 (M. C. Z. 47331) Mbanja, T. T. 29.iv.39.
22 (M. C. Z. 47332–3) Mikindani, T. T. iv.39.

Native names. Those applied to *L. p. picturatus* with which it occurs in the last three localities, as well as at Lindi.

Variation. Upper labials 6–9; lower labials 6–8; 4 *pairs* of lamellae under fourth toe; median subcaudals transversely enlarged except in one (M. C. Z. 47329) of the Ujiji geckos where a few pairs of scales occur in the transversely enlarged series, *i.e.* it is approaching the condition of *capensis*.

Coloration in life. ♂. Ujiji. Above, dark brown, a pale, black-edged light streak from nostril passes over upper part of eye and

along flank (where it becomes pinkish brown) to base of tail; crown of head pale, vermiculated with black; back with a scarcely distinguishable light vertebral line; limbs and tail with light mottling. Below, throat pure white; chest and belly cream color; tail pinkish. In young the tails are distinctly reddish.

Measurements. Largest ♂ (M. C. Z. 47329) measures 71 (31 + 40) mm., largest ♀ (M. C. Z. 47333) measures 61 (29 + 32) mm.

Breeding. On March 23, at Mikindani, a pair of eggs measuring about 6.5 x 5 mm., were preserved. On March 25, at Kitaya, several pairs measuring about 5.5 x 5 mm. were found beneath (1) fallen thatch of collapsed hut, (2) bundles of grass assembled for thatching, (3) piles of weeds.

Parasites. Bright red acarines present on Ujiji geckos.

Enemies. Eleven were recovered from stomachs of five spotted wood snakes (*Philothamnus s. semivariegatus*) at Ujiji, Mbanja, and Mikindani, of these six were in one snake from the last locality.

Habits. Adults occasionally squeak when captured. At Lindi one was seen on the same tree with a *L. p. picturatus*.

Habitat. The topotypic series were mostly taken when basking on the trunks of coconut palms about my tent. At Kitaya pawpaw trees were favoured. Towards evening these geckos were frequently disturbed among rubbish piled about the base of trees, up whose trunks they would dart; it would appear as if they passed the night in the rubbish if the trees offered no refuge such as holes or deep fissures.

Lygodactylus picturatus gutturalis (Bocage)

Hemidactylus gutturalis Bocage, 1873, Jorn. Sci. Lisboa, **4**, p. 211: Bissao, Portuguese Guinea.

1 (M. C. Z. 47340) Budongo Forest edge, U. 1.xii.38.
1 (M. C. Z. 47341) Bundibugyo, Uamba, U. 23.xii.38.
2 (M. C. Z. 47342) Ujiji, T. T. 12.iii.39.

Native name. Abagwakulu (Luamba).

Variation. Upper labials 6–7; lower labials 6–6; 5 *pairs* of lamellae under fourth toe; median subcaudals transversely enlarged.

Measurements. Largest ♂ (Ujiji) measures 80 (41 + 39) mm.

Enemies. Recovered from stomachs of spotted wood snakes (*Philothamnus s. semivariegatus*) at Katwe and Budongo.

Lygodactylus picturatus mombasicus Loveridge

Lygodactylus picturatus mombasicus Loveridge, 1935, Proc. Biol. Soc. Washington, **48**, p. 198: Kilindini, Mombasa Id., Kenya Colony.

2 (M. C. Z. 47339) Tanga, T. T. 22.vii.39.

Variation. Upper labials 7–8; lower labials 7–8; 6 *pairs* of lamellae under fourth toe; median subcaudals transversely enlarged.

Measurements. The adult ♂ measures 76 (38 + 38) mm., and is an undoubted example of this race which occurs together with the typical form in the Voi-Mombasa-Tanga triangle.

Lygodactylus picturatus picturatus (Peters)

Hemidactylus picturatus Peters, 1870, Monatsb. Akad. Wiss. Berlin, p. 115, n.n. for *variegatus* Peters, preoccupied: Zanzibar.

1 (M. C. Z. 47334) Kitaya, T. T. 25.iii.39.
4 (M. C. Z. 47335–6) Mikindani, T. T. 23.iii.39.
Embryo & 1 (M. C. Z. 47337) Siga Caves, T. T. 10.vi.39.
3 (M. C. Z. 47338) Amboni Estate, T. T. 19.vi.39.
Seen also at Lindi on the same tree as a *Lygodactylus g. grotei.*

Native names. *Nankwakwa* (Kiyao); *nangwagwa* (Kimahiwa); *kihetupetu* (Kimakonde). But all three applied also to *L. g. grotei.*

Variation. Upper labials 6–8; lower labials 6–8; 6 *pairs* of lamellae under fourth toe; median subcaudals transversely enlarged.

Measurements. Largest ♂♂ (Mikindani) each measured 43 mm. from snout to anus; tails reproduced. The large size attained in this region being reflected in the egg dimensions.

Breeding. On June 10, at Siga, an egg, containing embryo, preserved.

Enemies. Three recovered from the stomach of a hawk (*Accipiter b. polyzonoides*) shot in palm at sunset, one in another (*Accipiter m. tropicalis*) shot in palm at noon, both at Mikindani.

AGAMIDAE

Agama mossambica mossambica Peters

Agama mossambica Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 616: Coastal Province, Mozambique.

12 (M. C. Z. 47358–9) Kitaya, T. T. 25–31.iii.39.
6 (M. C. Z. 47360–1) Mikindani, T. T. 11.iv.39.
2 (M. C. Z. 47362) Mbanja, T. T. 27.iv.39.
3 (M. C. Z. 47363) Nchingidi, T. T. 13.v.39.
1 (M. C. Z. 47364) Lindi, T. T. 2.vi.39.

Native names. *Nampopo* (Kiyao); *nankandindumba* (Kimakonde at Kitaya); *nangwangula* (Kimakonde at Mikindani and Mbanja); *liwangula* (Kimawiha).

Variation. Midbody scale-rows 74–80; preanal pores 23–26.

Coloration. In life. ♂. Above, crown (sometimes also occiput and sides of head) olive; occiput and sides of head mottled with pale blue and white; back, limbs, and tail, pale olive tending to very pale blue along the vertebral line. Below, chin and throat anteriorly blue, dewlap black; remaining undersurfaces pale bronzy olive to white.

♀. Above, as male, but with a chain of broad, blood-red markings along the dorso-lateral region sometimes uniting on the vertebral line with the corresponding series on the other side.

Young ♀. Above, crown black, occipital scale pale blue, parietal region and sides of head bright ultramarine blue, circumorbital region pale buff as is also the vertebral line and a dorso-lateral line which unites with the vertebral line and its fellow by a series of saddle-like sepia markings; these are continued on to the tail as a series of dark blotches or bands which become fainter posteriorly; upper parts otherwise plumbeus. Below, throat faintly white, almost obscured by a network of dark and light blue, base of throat with a black patch; chest, belly, limbs, and tail cream colored.

The adults described above came from Kitaya, the young from Mikindani.

Measurements. Largest ♂ (Kitaya) measures 310 (120 + 190) mm., largest ♀ ♀ (Kitaya) measure 259 (99 + 160) mm., smallest (Nchingidi) measures 84 (34 + 50) mm.

Breeding. Between March 25–31, at Kitaya, all four females were gravid, the 6 (?) or 8 eggs measuring about 18 x 10 mm. in three examined. At this same time the largest male was shot while chasing another from his tree. At Mbanja and Nchingidi only very young agamas were seen, so that subspecific determination is only assumed.

Diet. Stomachs held: (1) Ants; (2) ants; (3) ants; (4) ants and big beetle; (5) ants; grasshopper; (6) ants; beetles; grasshoppers; chrysid bee; millipede; (7) ants; beetle larva; termite; millipede.

Parasites. At Kitaya and Mikindani almost all adults were heavily infested by acarines beneath the ventral scales; at Kitaya a single small ♀ nematode (*Abbreviata sp.*) was present in a stomach full of big black ants.

Agama mossambica montana Barbour & Loveridge

Agama mossambica montana Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 147: Below Bagilo, Uluguru Mountains, Tanganyika Territory.

7 (M. C. Z. 47365–6) Magrotto Mtn., T. T. 1.vii.39.

Native name. *Kokolwe* (Kisambara).

Variation. It is interesting to come straight from collecting the larger coastal form to the mountains where this differently colored dwarf race occurs, the males with only 12–14 preanal pores. Six of the series are adult, or subadult, males.

Measurements. Largest ♂ (M. C. Z. 47365) measures 259 (86 + 173) mm., only ♀ measures 237 (87 + 150) mm., and is gravid.

Agama atricollis Smith

Agama atricollis A. Smith, 1849, Illus. Zool. S. Africa, Rept., App., p. 14: Natal, South Africa.

8 (M. C. Z. 47343–4) Mabira Forest, U. 7.xi.38.
11 (M. C. Z. 47345–6) Budongo Forest, U. 23.xi.38.
4 (M. C. Z. 47347–8) Kibale Forest, U. 9.xii.38.
3 (M. C. Z. 47349–50) Bundibugyo, U. 21.xii.38.
6 (M. C. Z. 47351–2) Bugoye, U. 27.xii.38.
1 (M. C. Z. 47353) Nyakabande, U. 26.i.39.
1 (M. C. Z. 47354) Mushongero, U. 1.ii.39.
2 (M. C. Z. 47355) Kisenyi, B. R. 12.ii.39.
13 (M. C. Z. 47356–7) Idjwi Id., B. C. 22–28.ii.39.

Native names. *Konkome* (Luganda, Lutoro, Luwamba); *chihangara* (Lukiga); *buruburu* (Lulega).

Variation. Twenty males possess two, occasionally three, rows of preanal pores, apparently increasing with age, ranging from 15–30, average 22.

Color in life. Considerable difference as between Uganda and Congo males was noted, and recorded as follows: (Budongo). Above, head, anteriorly and on cheeks, turquoise blue; posteriorly, whole of back, sides, limbs, and middle third of tail, cobalt blue; anterior third of tail, olive, posterior third dark brown or black. Below, throat a mixture of turquoise and cobalt blue; yellow spots on cheeks and nape; a black patch in front of forelimbs which are blackish; chest

cobalt blue; belly buff mottled with black; anterior third of tail buffish white, median third tinged with cobalt, posterior third dark.

♂ (Idjwi). Above, head and cheeks turquoise blue; back and limbs yellow green; centre of flanks with a large patch of cobalt blue which reaches upwards towards vertebral line; base of tail slightly tinged with orange, followed by a band (40 mm. in width) of grayish brown, followed by a band (40 mm. in width) of pale blue, the remaining 40 mm. of tail grayish brown like the upper surface of hands and feet. Below, chin bright cobalt blue, centre of throat greenish flecked with yellow, base of throat black; chest, abdomen, and lower side of thighs, metallic old gold with patches of cobalt anteriorly and on sides and a black patch posteriorly; base of tail buff, followed by pale gray-brown and yellowish gray.

♀ (Idjwi). Above, head bluish, dark on crown, clearer on sides, circumorbital region and supraorbital ridge yellowish; nape blackish, the darker pigment extending midway along the back where it merges into pale bronze, a dorso-lateral chain of orange-red blotches; tail pale bronze with ill-defined black cross bands. Below, metallic pale bronze somewhat greener on chest.

Measurements. Largest ♂ (M. C. Z. 47343) measures 330 (120 + 210) mm., largest ♀ (M. C. Z. 47344) measures 263 (107 + 156) mm., smallest agama (Idjwi) measures 92 (40 + 52) mm.

Breeding. On November 7, at Mabira, embryos were discernible in the spherical, 8 mm. diameter eggs in a female! On February 23, on Idjwi, all three adult females were gravid, each holding 6 eggs measuring 10 x 17, 12 x 20, and 13 x 24 mm. respectively, while the last mentioned had a second series developing of about one-third the size.

Parasites. Nematodes (*Oochoristica* sp.) were present in several stomachs, and one, together with an immature ♀ trematode (*Strongyluris* sp.), was found in the peritoneum of a ♀ agama from Mabira; *Abbreviata britanica* recovered from a Budongo lizard.

Enemies. Recovered from the stomachs of two tree snakes (*Rhamnophis j. jacksoni* and *Thelotornis k. kirtlandii*) at Idjwi and Bundibugyo respectively.

Habitat. At Kisenyi, though one was taken on a palm trunk in town, many were seen on the lava road to the lava flow, as often on the ground as on shrubs!

ZONURIDAE

Zonurus tropidosternum Cope

Zonurus tropidosternum Cope, 1869, Proc. Amer. Philos. Soc., **11**, p. 169: "Madagascar." (error).

♂ (M. C. Z. 47367) Nchingidi, T. T. 9.v.39.

Native name. *Chigologolo* (Kimwera).

Variation. Nasals form a suture, thus differing from the type (M. C. Z. 5742). Incidentally *Cordylus* Laurenti should probably be used in preference to *Zonurus.*

Measurements. Total length 170 (90 + 80) mm.

Habitat. Shot while basking outside its hole in a tree at the forest edge; a glowworm was in its mouth as it came tumbling down.

Chamaesaura tenuior Günther

Chamaesaura tenuior Günther, 1895, Ann. Mag. Nat. Hist. (6), **15**, p. 524; pl. xxi, fig. B: Kampala, Uganda.

♀ (M. C. Z. 47368) Fort Portal, U. 19.xii.38.

Native name. *Nyarunyansi* (Lutoro and Luamba).

Breeding. On December 12, this 138 mm. (snout to anus) ♀ held embryos.

VARANIDAE

Varanus ocellatus Rüppell

Varanus ocellatus Rüppell, 1827, Atlas Reise nörd. Afrika, p. 21, pl. vi: Kordofan, Anglo-Egyptian Sudan.

Skull & 5 (M. C. Z. 47369–74) Mikindani, T. T. 15–21.iv.39.
Skull & skin (M. C. Z. 47375) Siga Caves, T. T. 12.vi.39.

Native names. *Liongondo* (Kimakonde); *ngondo* (Kimawiha).

Color in life. ♂ (Mikindani). Above, crown black, back and flanks blue-gray, three broad (*i.e.* 3–4 scales wide) black lines on nape, the median forked anteriorly and posteriorly so as to surround two large light ocelli, each of which has three black scales in its centre, these form the first of seven transverse rows of similar ocelli, the intermediate rows being composed of small, less well-defined, light spots, with or without black scales, the intervening area is covered by a

heavy black network which almost obscures the ground color; limbs black, spotted with yellow, such spots being usually formed of groups of three yellow scales; tail black with thirteen alternating broad and narrow, light (yellowish to bluish) crossbands speckled with black. Below, lower jaw blue-gray; throat olivaceous with obsolescent dark spots; soles of feet brown, the centre of each scale often black; rest of undersurfaces yellowish or white with a blue-gray network.

Young ♂ (Mikindani). Circumnasal area, limbs anteriorly, and throat, greenish, otherwise like adult, but the blue-gray ground color much more distinct so rendering the black network more conspicuous; spots clear white; bars on tail less well-defined.

Measurements. Largest ♂ (M. C. Z. 47375) measures 1500 + (700 + 800 + tip of tail) mm., *i.e.* 4′ 9½″; weight 13 lbs.; skull length 135 mm. Another ♂ (M. C. Z. 47370) measures 1440 + (620 + 820 + tip of tail) mm., *i.e.* 4′ 8″ (2′ + 2′ 8″).

Breeding. On April 21, at Mikindani, a ♀ held numerous small ova 14 mm. in diameter.

Diet. Her stomach held a large slug and five snails (*Achatina* sp.), that of a Mikindani male, two giant crickets (*Brachytrypetes membranaceus*).

Parasites. Ticks and nematodes on, and in, last monitor.

Enemies. At Mikindani some Yao showed me a big male (skull is M. C. Z. 47369) which they were about to eat. Fortunately the poor beast, lashed to a pole, was dead, for they had severed each foot at the base, being afraid, so they said, of its claws.

Habitat. These big lizards are distressingly tough. One, which I shot as it was basking high in a coconut palm, though mortally wounded, made a dash for the burlap-like fibre about the stem and hid there till fetched down by my gunbearer.

The Siga male was basking on the branch of a wild fig at a height of sixty feet from the ground. Except that its head sank slowly to the branch, it never moved when I shot it with No. 3 from a twelve gauge. Two hours later, having in the meantime returned to camp for a 120 ft. rope, I climbed a cliff and, after the fifth attempt, succeeded in throwing a stone, attached to the rope, over the limb and eventually beneath the monitor's chin. Each time that the rope was pulled the reptile's head waggled to and fro lifelessly. Suddenly, to our amazement, the tail wriggled, the head was raised, the tongue flickered, and the almost five-foot lizard turned about on the broad limb. Quickly I gave it a charge of No. 8 from the .410, which brought it crashing down sixty feet. Even then it started to crawl away until I seized it by the tail.

Varanus niloticus (Linnaeus)

Lacerta nilotica Linnaeus, 1766, Syst. Nat., ed. 12, **1**, p. 369: Egypt.

3 (M. C. Z. 47376) Mbanja, T. T. 28.iv.39.
1 (M. C. Z. 47377) Siga Caves, T. T. 14.vi.39.
1 (M. C. Z. 47378) Magrotto Mtn., T. T. 1.vii.39.

Native names. *Ngondo* (Kimakonde); *mbulu* (Kisambara).

Variation. In a young Mbanja monitor the nostril is only 1 mm. nearer the orbit than it is to the end of the snout.

Measurements. Largest (M. C. Z. 47377) measures 1170 (430 + 740) mm., *i.e.* 3′ 8½″, and weighed 4½ lbs.

Habitat. The three young Mbanja lizards were shot in shrubs bordering a stream, the Magrotto monitor in a tree at edge of rain forest, it dropped from the tree and plunged into a stream, then swam under water to a hole in the bank which it entered.

AMPHISBAENIDAE

As all pertinent information regarding the amphisbaenids collected during the course of the expedition has been incorporated in my recent revision of the African members of this family (Bull. Mus. Comp. Zoöl., **87**, pp. 353–451, figs. 1–53), they need be only listed here.

Amphisbaena phylofiniens Tornier

Amphisbaena phylofiniens Tornier, 1899, Zool. Anz., **22**, p. 260: Ujiji, Tanganyika Territory.

4 (M. C. Z. 47901–4) Ruanda, Ujiji, T. T. 11–15.iv.39.

Amphisbaena orientalis (Sternfeld)

Amphisbaenula orientalis Sternfeld, 1911, Sitz. Ges. Naturf. Freunde Berlin, p. 246: Mikindani, Tanganyika Territory.

1 (M. C. Z. 47905) Mikindani, T. T. 24.iv.39.

Amphisbaena ewerbecki (Werner)

Chirindia ewerbecki Werner, 1910 (1909), Mitt. Zool. Nat. Mus. Hamburg, **27**, p. 37: Mbanja (Banja), Tanganyika Territory.

70 (M. C. Z. 47906–49) Mbanja, T. T. 26–30.iv.39.
1 (M. C. Z. 47950) Lindi, s.e. T. T. 1.vi.39.

Amphisbaena rondoensis Loveridge

Amphisbaena rondoensis Loveridge, 1940, Bull. Mus. Comp. Zoöl., **87**, p. 394 fig. 23: Nchingidi, Rondo Plateau, Tanganyika Territory.

49 (M. C. Z. 47951–99) Nchingidi, T. T. 9–19.v.39.

These are the Type and Paratypes of a form which would be referred to the genus Chirindia if grounds for its revival should be forthcoming. The series showed no overlapping with the seventy topotypes of its nearest ally, *ewerbecki,* occurring in low-lying country fifty miles to the north.

LACERTIDAE

Nucras boulengeri kilosae Loveridge

Nucras kilosae Loveridge, 1922, Proc. Zool. Soc. London, p. 314: Kilosa, Usagara, Tanganyika Territory.

3 (M. C. Z. 47379–80) Nchingidi, T. T. 13.v.39.

Variation. It is interesting to note that the keels were not noticeable on these very young specimens unless dry; their scale-counts fall within the range of this race though the record involves a southeastward extension of the range nearly 300 miles.

Color in life. Above and on sides, black, a cream stripe from rostral to frontal, latter, as well as some other head scales, edged with creamy white; upper lip and sides handsomely spotted with white; a vertebral and two slightly narrower, light, dorso-lateral lines tinged with salmon; tail translucent pink with a broad, black, median, longitudinal line on the base and two ill-defined ones on the sides. Below, chin, throat, breast, abdomen, and fore limbs, white; hind limbs and tail pink.

Habitat. Taken on sandy paths in eroded areas of the forest.

Lacerta versus Algiroides

Though the genotypes of these two groups are distinct enough, some of the intermediate forms are not so readily distinguishable. *Lacerta jacksoni,* as stated by Tornier, appears closely related to *vauereselli* in the moderate size and keeling of the dorsal scales which are juxtaposed or subimbricate in *jacksoni,* slightly imbricate in *vauereselli*; in fact, the quickest way to distinguish the two, apart from the lower femoral pore counts of the latter, is in the presence in preserved specimens of *jacksoni* of a white background to the femoral pores and cir-

cumanal areas which are uniform in *vauereselli*. The transference of the latter to *Algiroides*, makes necessary the following amendment to the key to those genera as presented by Boulenger (1920, Monogr. Lacertidae, **1**, p. 2), viz.

Dorsal scales small or moderate, smooth or strongly keeled, juxtaposed or subimbricate . . . . *Lacerta*
Dorsal scales moderate or large, strongly keeled, imbricate . . *Algiroides*

Lacerta jacksoni Boulenger

Lacerta jacksoni Boulenger, 1899, Proc. Zool. Soc. London, p. 96, pl. x: Ravine Station, 7500 feet, Mau Mountains, Kenya Colony.

1 (M. C. Z. 47381) Nyakabande, U. 29.i.39.
1 (M. C. Z. 47382) Mushongero, U. 30.i.39.
2 (M. C. Z. 47383–4) Kisenyi, B. R. 10.ii.39.
85 (M. C. Z. 47385–94) Idjwi Id., B. C. 13–28.ii.39.

Native names. Ngondochero (Lukiga); *karunduguru* (Lulega).

Variation. Femoral pores 14–19, the former number on 9 sides only, the latter only on 1 side (M. C. Z. 47383), 15–17 being normal with an average of 16.6 pores for 159 sides (the 160th side being damaged).

Coloration. ♂ (Kisenyi). Above, brown, marbled with black on dorsum and tail and with more or less longitudinal series of cream-colored spots, each consisting of one or two scales; sides spotted with cream and pale blue. Below, lower labials, like the upper, spotted with black; throat to collar white; chest and belly yellowish white; limbs bright yellow; tail white.

Measurements. Largest ♂ (M. C. Z. 47385) measures 231 (83 + 148) mm., but half-a-dozen others are 82 mm. from snout to anus; largest ♀ (M. C. Z. 47390) measures 187 (76 + 111) mm.

Breeding. On January 29, at Nyakabande, a ♀ held 3 eggs measuring 14 x 8 to 15 x 7 mm. Between February 13 and 28, on Idjwi Island, many ♀ ♀ were gravid, five (of 65–76 mm. head and body length) examined held from 3–5 eggs ranging from 11 x 9 to 15 x 9 mm., *i.e.* about ready for laying.

Diet. Stomachs held (1) two large crickets, (2) limbs of big spider.

Enemies. One recovered from stomach of a green snake (*Chlorophis irregularis*) on Idjwi.

Habitat. Where, as at Mushongero and Kisenyi, deforestation has occurred, it is interesting to observe the adaptability of this arboreal species which was living in holes in the earth bank of the terraced

roadway leading to Lake Mutanda; while at Kisenyi I captured two that were basking on the road but retreated into crevices between the blocks of lava which formed the foundation for the road down to Lake Kivu.

ALGIROIDES VAUERESELLI (Tornier)

Lacerta vaucreselli Tornier, 1902, Zool. Anz., **25**, p. 701: Kagera, west of Lake Victoria, Tanganyika Territory.

Algiroides boulengeri Peracca, 1917, Atti Acc. Torin, **52**, p. 351: Fort Portal, Toro, Uganda.

16 (M. C. Z. 47395–404) Idjwi Id., B. C. 20–28.ii.39.

Native name. Kavunduguru (Lulega).

Synonymy. Though I have not seen types of either of the two species listed above. I am confident that the synonymizing of *boulengeri* is correct. Its type locality is only 120 miles north of that of *vauereselli*, taking the Kagera River at its nearest point. *L. vauereselli*, already recorded from Idjwi Island, has been considered a great rarity until now, so that it seems advisable to furnish the statistical data derived from this fine series in some detail.

Variation. Nasals separated (M. C. Z. 47395) or in contact (M. C. Z. 47396); upper labials anterior to subocular 3–5, normally 4; dorsal scales across midbody 35–43; gular scales from mental to collar 20–27; plates in collar 6–8; transverse rows of ventrals from collar to crotch 17–22; longitudinal rows of ventrals 6–8; femoral pores 8–12, average 9; lamellae beneath fourth toe 17–22; adpressed hind limb reaches axilla or shoulder in females, shoulder or collar in males.

Coloration. In life. Adult ♂. Above, head dark bronze; tip of snout and a broad dorsal band, light bronze; from nostril through eye and along flanks a broad, brown, lateral band, darker above; upper lip light-colored the coloring continued as a light line to insertion of fore limb; between fore and hind limbs are two rows of black-edged, cream-centered ocelli; on vertebral line, at least posteriorly, a chain of dark spots; tail flecked with darker brown. Below, metallic whitish gray (black in formalin).

Young—67 mm. Above, as adult, but end of snout greenish; dorsal band edged on either side by a row of cream-colored spots, those on the sides brighter, some tinged with green. Below, chin and throat, extending to upper lip, and tail, from a short distance behind anus, bright blue; rest of lower surface of body and limbs, bright grass-green.

Measurements. Largest ♂ (M. C. Z. 47400) measures 197 (62 + 135) mm., largest ♀ (M. C. Z. 47399) measures 171 (57 + 114) mm.

Breeding. Several ♀ ♀ gravid, one examined held 3 eggs measuring 8 x 6 mm.

Diet. A grasshopper in each of five stomachs examined.

Enemies. One recovered from the stomach of a wolf snake (*Lycophidion c. ornatum*).

Algiroides africanus Boulenger

Algiroides africanus Boulenger, 1906, Proc. Zool. Soc. London, **2**, p. 570, fig. 96: Entebbe, Uganda.

2 (M. C. Z. 47405–6) Mabira Forest, U. 10–16.xi.38.
8 (M. C. Z. 47407–12) Budongo Forest, U. 29–30.xi.38.
1 (M. C. Z. 47413) Kibale Forest, U. 9.xii.38.
2 (M. C. Z. 47414–5) Idjwi Id., B. C. 6.iii.39.

Native name. *Kalumbalunda* (Luganda).

Variation. Dorsal scales across midbody 20–24; plates in collar 6–9; transverse rows of ventrals from collar to crotch 18–22; longitudinal rows of ventrals 6; femoral pores 12–16; lamellae beneath fourth toe 17–22; adpressed hind limb reaches shoulder or collar in females, collar or beyond in males.

Coloration. In life. Budongo. Above, dark rufous brown with an irregular vertebral series of black spots; flanks and limbs sepia brown spotted with black; tail transversely barred with darker and lighter. Below, throat grayish with a metallic lustre; chest from collar, abdomen to basal portion of tail, bright green, rest of tail brown.

Measurements. Largest ♂ (M. C. Z. 47414) measures 167 (60 + 107) mm., largest ♀ measures 67 mm. in head and body length, tail missing.

Breeding. On November 16, at Mubango, ova small, about 6 x 5 mm.

Diet. Stomachs held: (1) Large spider, (2) spiders and egg packet, (3) orthopteran and very small insects, (4) black cricket, (5) cricket, (6) cricket.

Parasites. Two larval nematodes (Physalopteridae) in stomach of Mubango lizard.

Enemies. Recovered from stomachs of green snake (*Chlorophis hoplogaster*) and cobra (*Naja melanoleuca*) at Mubango, Mabira Forest.

Habitat. Most usually to be seen basking at whatever height the

sunlight happened to be striking the trunks of trees fringing the forest edge or clearing: frequently beside some knot hole or piece of loose bark, in, or beneath, which they could seek refuge when disturbed. Judging by their diet, much of their hunting is done on the ground, and a Mabira lizard was discovered beneath a pile of mulch in a banana plantation adjacent to the forest.

Ichnotropis squamulosa Peters

Ichnotropis squamulosa Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 617: Tete, Mozambique.

♂ (M. C. Z. 47416) Kitaya, T. T. 2.iv.39.

Coloration. Differs from all our comparative material in that the entire under surface is black, perhaps this is correlated with the specimen being an adult breeding male, whose testes are much enlarged.

Diet. Two spiders and two young crickets.

Habitat. Shot on a sandy path through dry scrub, the two or three seen were exceedingly wary and the species unknown to the local natives — Konde and Yao, though it has been recorded already from the not far distant Konde Plateau.

Eremias spekii spekii Günther

Eremias spekii Günther, 1872, Ann. Mag. Nat. Hist. (4), **9**, p. 381: Unyamwezi Tanganyika Territory.

3 (M. C. Z. 47417–9) Siga Caves, T. T. 8.vi.39.

Also seen on Amboni Estate, both localities being near Tanga.

Coloration. In life. Young — 80 (26 + 54) mm. Above, head brown, dorsum black, three slightly pinkish lines commencing behind parietals converge to form a single vertebral line which becomes pink on tail, a cream-colored dorso-lateral line commencing at orbit broadens and becomes pink on tail, a cream-colored lateral line from rostral, over labials, through tympanum, after which it breaks up into a series of dots and dashes on flank. but is continued (as dots) along the anterior surface of hind limb to the foot; both fore and hind limbs spotted. Below, white, except for tail, which is red.

Holaspis guentheri Gray

Holaspis guentheri (A. Smith) Gray, 1863, Proc. Zool. Soc. London, p. 153, pl. xx, fig. 1: No type locality.

♂ (M. C. Z. 47420) Budongo Forest, U. 29.xi.38.
♂ ♂ (M. C. Z. 47421–2) Magrotto Mtn., T. T. 7.vii.39.

Native name. *Chungura* (Kisambara).

Color in life. ♂ (Budongo). Above, pale creamy green with black vertebral line bifurcating on nape and head; flanks with three black longitudinal lines; median line of tail pale blue edged with black and flanked with yellow. Below, throat and fore limbs grayish white tinged with pink; chest and belly bright orange extending on to the hind limbs which otherwise are yellow; anterior two-thirds of tail yellow transversely barred with black, posterior third pale blue but similarly barred with black.

The tails of the Magrotto males differed somewhat, that of the larger being yellow below, and of the smaller bright blue bordered by bright yellow, each segment with a pair of black spots.

Measurements. Largest (M. C. Z. 47420), apparently a record, measures 123 (53 + 70) mm

Diet. A moth in its stomach.

Parasites. Red acarine parasites on its flanks anteriorly, added to the appearance of this beautiful species.

Preserved in amber. Five years ago Dr. Thomas Barbour showed me a specimen of *Holaspis guentheri*, minus the posterior portion of its hind limbs and tail, which was embedded in a small block of amber-like substance. So well preserved was the specimen that one could count the 24 rows of dorsals at midbody, and the 31 or 32 gular scales between mental and medium collar plate. The femoral pores, however, were uncountable, nor was the precise position of the nostril clear. The lizard appears indistinguishable from the species which today ranges right across tropical Africa, in the west from Sierra Leone to Angola, in the east from the Usambara Mountains to Nyasaland.

The specimen had been found in a desk drawer of the late Director of the Museum of Comparative Zoölogy, Mr. Samuel Henshaw, and unfortunately bore no label. Mr. Henshaw, being approached regarding its history, stated that it was one of "two lizards in amber" which formed part of the collection of the late Dr. Hagen of Königsberg.

On hearing of the Königsberg association, my interest was aroused

because of the implications regarding the lizard allegedly embedded in Baltic amber in the Königsberg Museum. Fifty years ago this reptile was thought to be a *Cnemidophorus* by Boettger, but subsequently named *Nucras succinea* by Boulenger (1917, Ann. S. African Mus., **13**, p. 195, footnote) on the basis of the description given by Klebs (1910, Schrift. Physik. Ges. Konigsberg, **51**, p. 217) who had shown him the lizard in 1891.

Dr. Frank M. Carpenter kindly identified two diptera which were embedded with the *Holaspis*, as *Phlebotomus* and *Trigona*, wide-ranging genera which shed no light on the place of origin. Then, becoming interested, Dr. Carpenter, together with Mr. F. J. Gettens, staff chemist of the Fogg Art Museum at Harvard, investigated the composition of the material and definitely demonstrated that it was not Baltic amber. This amber has a melting point of about 50° Cent. higher than that of any of the copals. They reached the conclusion that the melting point of this specimen was nearer to that of Congo copal than to the Zanzibar product.

In this connection it may be recalled that Peters (1865, Monatsb. Akad. Wiss. Berlin, pp. 455–457) discussed the presence of a gecko embedded in Zanzibar copal. It had formed one item in a collection of embedded animals and plants brought back by F. O'Swald after several years sojourn on the island. Peters referred the gecko to *Lygodactylus capensis* (A. Smith) which, with its synonym *strigatus* Gray, was the only member of the genus known at that time. It is probable, however, that it should be identified as the scarcely distinguishable *grotei* Sternfeld (1911) which is the common species of the adjacent coast and neighbouring islands.

This raises the question as to whether *Nucras succinea* is really embedded in Baltic Oligocene amber, and therefore "the oldest known Lacertid" as stated by Boulenger (1920, Monogr. Lacertidae, **1**, p. 7). When he examined it in 1891, the genus was known only from south of the Zambesi, since then its range has been extended to equatorial East Africa, though not the Congo. It has not been recorded from Zanzibar but does occur on the adjacent mainland 150 miles due west of Zanzibar, where the form which I named *N. boulengeri kilosae* is found, a race which ranges from Kajiado, Kenya Colony, south to the Rondo Plateau, some fifty miles southwest of Lindi Bay, Tanganyika Territory.

Very little, if any, of what is known as "Zanzibar copal" came from the island itself; Capt. J. F. Elton, writing from Kisiju, Kwale District, a dozen miles south of Dar es Salaam, says: (1879, Travels and Re-

searches among the Lakes and Mountains of Eastern and Central Africa, p. 78) "Everywhere signs of copal diggings were visible. In fact we were passing through the main fields from which the Zanzibar market was once almost entirely supplied, and which still produce the valuable gum in considerable quantities."

Should it ever be proved that the embedding medium of *succinea* is Zanzibar copal, the name *succinea* might have to take precedence over that of *kilosae*. Unfortunately, according to Klebs, the specimen suffered so severely at the time of its examination that few of the characters once observable, can now be seen.

GERRHOSAURIDAE

GERRHOSAURUS NIGROLINEATUS NIGROLINEATUS Hallowell

Gerrhosaurus nigro-lineatus Hallowell, 1857, Proc. Acad. Nat. Sci. Philadelphia, p. 49: Gaboon.

Gerrhosaurus flavigularis forma *intermedia* Lönnberg, 1907, in Sjöstedt, Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro, Meru . . . , No. 4, p. 7, pl. i, figs. 1a–b: Steppe near Lake Natron, Tanganyika Territory.

Gerrhosaurus nigrolineatus auritus FitzSimons, 1939a, Ann. Transvaal Mus., **20**, p. 10: Kaapmuiden, eastern Transvaal.

3 (M. C. Z. 47423–5) Kitaya, T. T. 25.iii.39.
1 (M. C. Z. 47426) Mikindani, T. T. 18.iv.39.
2 (M. C. Z. 47427–8) Mbanja, T. T. 28.iv.39.
1 (M. C. Z. 47429) Nchingidi, T. T. 9.v.39.
2 (M. C. Z. 47430) Lindi, T. T. 2.vi.39.

Native names. Ligondo (Kiyao); *liwalawahi* (Kimakonde at Kitaya;) *naugkwakata* (Kimakonde at Mbanja).

Synonymy. Reasons for reverting to the opinion that *nigrolineatus* of East Africa is inseparable from the typical form of West Africa, and also for referring *australis* to the synonymy, were recently furnished in a revision of the family (1942, Bull. Mus. Comp. Zoöl, **89**, p. 511).

Variation. Dorsal scales transversely 22–26, average 24; supraciliaries 4, except for No. 47428 with 5; length from snout to hind edge of ear contained in that from snout to anus 3.25–4.33 times. The lower figures are those of emergent young.

Breeding. On March 25, at Kitaya, six eggs were found beneath a pile of rotting vegetation; on opening one egg I found an embryo so

small that I placed the remaining five in a tin of damp sand and grass. During the succeeding months the eggs were examined periodically, one egg which had dried up was discarded. On opening the tin on June 8 I found three lizards so recently emerged that the albumen upon them was still moist. I measured one of them and found it (M. C. Z. 47425) was 181 (56 + 125) mm., but after two years in preservative only 170 (53 + 117) mm. The remaining egg seemed to have swollen somewhat since first collected, it now measured 30 x 22 mm.

In anticipation of a long wait, I sat down with the egg lying on my palm. Almost immediately, however, there was a convulsive movement and a long slit appeared at one end of the parchment-like shell, about one minute later the little lizard's snout (up to and including the eyes) was thrust out, another minute elapsed and then the rest of the head appeared. For seven minutes thereafter nothing more occurred, then the forepart up to the hind legs crawled out, to be followed, a couple of minutes later, by the long tail. The little creature lay breathing heavily on my hand and offered no objection to being picked up and placed upon the table. Suddenly, with the unexpectedness which characterized most of its actions, and as if a fall of two and a half feet was of no account, it leaped to the ground and raced away with a fine turn of speed. I let it go. The whole emergence had taken place between 10.45 and 11.10 a.m.

Apparently there is a definite season for such hatching along the East Coast, for hatchlings, either 6 mm. smaller or larger than the dimensions given above, were taken on April 8, May 5, and June 6 (*loc. cit. supra*), while recently emerged young were seen on paths at Kiponda, Rondo Plateau, and in Amboni Estate, near Tanga, on May 8, and June 20, respectively. Moreover, ovules were small in an adult ♀ taken on June 2 at Lindi.

Diet. Stomach of this ♀ held grasshoppers, termites and an *Ennea* shell; that of a young lizard, grasshoppers.

Enemies. Both Mbanja hatchlings, and another (not preserved) from Amboni, were recovered from the stomach of two hawks (*Kaupifalco monogrammica*); one had been swallowed by a house snake (*Boaedon l. lineatus*) at Nchingidi, and two by wolf snakes (*Lycophidion c. capense*) at Mikindani and Amboni. At Kitaya a big adult was taken in a rat trap baited with meat which probably attracted insects.

SCINCIDAE

Mabuya maculilabris maculilabris (Gray)

Plate 4, fig. 2.

Euprepis maculilabris Gray, 1845, Cat. Lizards Brit. Mus., p. 114: West Africa.

Mabuia maculilabris var. *kwidjwiensis* Sternfeld, 1912, Wiss. Ergebn. Deut. Zentral-Afrika-Exped. 1907–1908, **4**, p. 233: Kwidjwi Island, Lake Kivu, Belgian Congo.

2 (M. C. Z. 47431–2) Mabira Forest, U. 5.xi.38.
3 (M. C. Z. 47433–5) Budongo Forest, U. 20.xi.38.
1 (M. C. Z. 47436) Butiaba swamp, U. 5.xii.38.
1 (M. C. Z. 47437) Kibale Forest, U. 16.xii.38.
1 (M. C. Z. 47438) Bundibugyo, U. 26.xii.38.
64 (M. C. Z. 47451–500) Idjwi Id., B. C. 16–28.ii.39.
2 (M. C. Z. 47439–40) Ujiji, T. T. 13.iii.39.
2 (M. C. Z. 47405–6) Mikindani, T. T. 10.iv.39.
2 (M. C. Z. 47445) Amboni Estate, T. T. 19.vi.39.
4 (M. C. Z. 47601–4) Likoni, K. C. 25.vii.39.

Seen also at Kisenyi, B. R., and near Siga Caves, T. T.

Native names. *Munya* (Luganda); *kifumbatanjoka* (Lutoro); *kilamerembi* (Luamba); *sazi* (Lulega).

Variation. The disposition of skinks of this difficult group must remain somewhat unsatisfactory until such time as a thorough revision of the genus can be undertaken. The long series of topotypes of *kwidjwiensis* were secured in the hope that it might be possible to recognize the race; however, after taking a series of one thousand observations on the fifty catalogued specimens, no grounds were found for doing so. This Idjwi series furnished the following data:

Centre of nostril above first labial, rarely above the suture between rostral and first labial; postnasal not, or but rarely, in contact with the second labial; frontonasal in contact with the rostral (12 ex.) though more usually separated (38 ex.); frontonasal in contact with frontal (17 ex.), usually separated (33 ex.); interparietal subequal to, or larger than, the frontoparietals (40 ex.) sometimes definitely smaller (10 ex.); frontal separated from (40 ex.) or in contact with (10 ex.) first supraocular; supraoculars 4 (constant on both right and left); supraciliaries (one side only examined) 4 (1 ex.), 5 (46 ex.), or 6 (3 ex.); lobules on anterior border of ear-opening normally 3, rarely 1 or 2 or indistinguishable; nuchals obtusely carinate; dorsals with 5 (young) to 7 (adults) or very rarely 8, keels; midbody scale-rows 30

(11 ex.), 31 (5 ex.), 32 (28 ex.), 33 (3 ex.), or 34 (3 ex.); from 2 to 4 preanals slightly, sometimes scarcely appreciably, enlarged; the adpressed hind limb fails to meet or meets the fingers of the backward pressed fore limb in 14 females and 1 male (M. C. Z. 47496), the wrist or elbow in 30 males (all of which have the hemipenes extruded).

The data derived from the Uganda, Tanganyika, and Kenya material falls within this range except that some young have tricarinate dorsals, that midbody scale-rows number 32–34 in about equal proportions, and that the sexual dimorphism of limb length noted in Idjwi skinks is not so reliable in coastal material.

Coloration. On Idjwi one gained the impression that the skinks were consistently more handsome than elsewhere, particularly at the coast. However, the following color notes were made in the field.

Budongo Forest, ♂. Above, olive, with ill-defined longitudinal rows of black spots on dorsum with finer green flecks interspersed between them; lips yellow, the latter color continuing on towards ear where it changes to orange, then fades out on flank about midbody; tail spotted with black. Below, pale yellow, spotted with black on throat and tail; chest and belly slightly brighter yellow, immaculate.

Idjwi Id., ♂. Above, black flecked with pale green, or olive flecked with black and pale green. Below, throat and flanks blood-orange; chest, abdomen, and underside of limbs very pale yellow; soles of feet dusky; tail whitish, uniform or spotted with black and tinged with pink towards the tip. N.B. Young ♂ ♂ have throats which are white, spotted with black, like those of the females.

Idjwi Id., ♀. Above, dark olive or brown, uniform or flecked with black and usually also with pale green. Below, throat lemon yellow; rest of underparts pale greenish white, or else this coloring reversed, viz. throat white spotted with black, chest and abdomen bright yellow; soles of feet and underside of tail as in ♂ ♂.

Idjwi Id., young. Above, dark brown, a bar of sepia brown from eye along flank. Below, white, immaculate.

Ujiji. ♂. Above, substantially similar to those from Idjwi Id. as described above. Below, throat white, spotted with black; otherwise in agreement with the Idjwi skink.

Measurements. Largest Idjwi ♂ (M. C. Z. 47451) measures 282 (92 + 190) mm., largest ♀ (M. C. Z. 47480) 222 (94 + 128) mm., but tail regenerated; females appear to average slightly smaller than males. From elsewhere largest ♂ (M. C. Z. 47434) measures 250 (88 + 162) mm., and ♀ (M. C. Z. 47601) 212 (86 + 126) mm., but tail of latter, possibly that of former also, regenerated.

Breeding. In February, on Idjwi, and July, at Likoni, females were found with both small ova and large eggs; 6 of the latter from a Likoni skink, measured 10 x 15 mm.

Diet. Stomachs held: large spider; several ants; real wasps; parasitic wasp; plant bugs; small weevil; plant beetles; fly; moths; grasshoppers and a cockroach.

Parasites. Nematodes were present in one of the Likoni skinks.

Enemies. One recovered from the stomach of a *Lycophidion c. ornatum* on Idjwi, another from a *L. c. capense* at Amboni, near Tanga.

Habitat. On wall of house at Mubango, Mabira; beneath vegetational debris in a banana plantation at Ujiji; under piles of palm fronds and coconut husks at Likoni.

MABUYA MACULILABRIS COMORENSIS (Peters)

Euprepes comorensis Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 619: Anjuan, *i.e.* Johanna Island, Comoro Islands.

7 (M. C. Z. 47446–50) Magrotto Mtn., T. T. 3.vii.39.

Native name. Ghondo (Kisambara), but generic.

Variation. These skinks are subspecifically identical with the extensive series from the Usambara Mountains discussed by Barbour and Loveridge (1928, p. 156). They differ from typical *maculilabris* in having 34–36 midbody scale-rows, together with a more robust build and shorter tail.

Measurements. Largest ♂ (M. C. Z. 47447) measures 243 (90 + 153) mm.

Habitat. Not uncommon at forest-edge where they may be seen basking on tree-trunks, both vertical and fallen.

MABUYA MACULILABRIS BOULENGERI Sternfeld

Mabuia boulengeri Sternfeld, 1911, Sitz. Ges. Naturf. Freunde Berlin, p. 248: Makonde Plateau, Lindi Province, Tanganyika Territory.

1 (M. C. Z. 47441) Kitaya, T. T. 2.iii.39.
3 (M. C. Z. 47442–3) Mikindani, T. T. 21.iv.39.
1 (M. C. Z. 47444) Nchingidi, T. T. 18.v.39.

Native names. Chengamawta (Kiyao); *chipakamawta* (Kimakonde); *linyeranenda* (Kimawiha).

Variation. In 1928 I relegated *boulengeri* to the synonymy of *maculilabris*, now, after collecting the above series of both sexes and ages

from points around the type locality, I am prepared, though with some misgivings to recognize it. It appears to differ from typical *maculilabris* in having 4 supraciliaries as a constant feature, whereas in the typical form 4 occurs only as a very exceptional deviation from 5–6; it has a longer tail and much more uniform coloring. Midbody scale-rows 30 (3 ex.) or 32 (2 ex.), whereas the typical form on the East Coast has 32–34.

Coloration. ♀. Kitaya. Above, uniform brown; sutures of upper and lower labials black; a series of black dots from eye to ear; flanks paler than dorsum. Below, throat pure white; belly tinged with yellow; tail buffy white, the lateral borders of the scales edged with greenish black resulting in four, irregular, longitudinal lines (as in *megalura*).

Measurements. Largest ♂ (M. C. Z. 47442) measures 268 (76 + 192) mm., only ♀ (M. C. Z. 47441) 232 (84 + 148) mm., tail regenerated.

Sexual dimorphism. In males the toes of the adpressed hind limb overlap the fingers of the backward pressed fore limb, in the female they fail to meet.

Diet. One stomach held a large spider, two others a large cricket each.

Habitat. The female I found asleep on the frond of a doom palm at the edge of a swamp, she was at a height of about five feet from the ground. The three males from Mikindani were shot while basking on the trunks of three adjacent coconut palms, it is interesting to note that two typical *maculilabris* were obtained at Mikindani, also upon the stems of coconuts, eleven days before.

Mabuya planifrons (Peters)

Euprepes (Euprepis) planifrons Peters, 1878, Monatsb. Akad. Wiss. Berlin, p. 203, pl. ii, fig. 2: Teita, Kenya Colony.

4 (M. C. Z. 46707–9) Amboni Estate, T. T. 19.vi.39.

Variation. Midbody scale-rows 28; dorsals with 3–7 keels; supranasals in contact; prefrontals separated; supraoculars 4–4; supraciliaries 5–6.

Measurements. Larger ♂ (M. C. Z. 47609) measures 261 (111 + 150) mm., and larger ♀ (M. C. Z. 47607) 328 (116 + 212) mm.

Diet. One disgorged a very large grasshopper when caught.

Habitat. All were dislodged by a tractor from piled and rotting vegetation.

MABUYA MEGALURA (Peters)

Euprepes (Mabuia) megalura Peters, 1878, Monatsb. Akad. Wiss. Berlin, p. 204, pl. ii, fig. 4: Teita, Kenya Colony.

33 (M. C. Z. 47610–9) Idjwi Id., B. C. 18–28.ii.39.

Native name. *Kahirira* (Lulega).

Variation. Midbody scale-rows 24–26; dorsals very obtusely tricarinate, or (in old females) smooth; supranasals in contact (28 ex.), or separated (5 ex.); prefrontals in contact (5 ex.), or separated (28 ex.); supraoculars 4–4; supraciliaries 3–5.

In skinks of this species the exceptionally slender tail is more often regenerated than otherwise, nor are such regenerated tails readily recognized without magnification. Of the present series only six possess their original tails intact and in all of these the length of the tail is more than twice that of the head and body. Recently de Witte (1933m, p. 76) revived the name *massaianus* (Fischer, 1884) for some Congo skinks on the ground that their tails were not twice the length of the respective head-and-body length.

Measurements. Largest ♂ (M. C. Z. 47612) measures 199 (56 + 143) mm.; largest ♀ (M. C. Z. 47616) 215 (69 + 146) mm., but both are surpassed in head-and-body length by others of (♂) 61 mm. and (♀) 75 mm. respectively which have regenerated tails.

Breeding. In February all adult females appeared to be gravid, five examined held 4, 4, 6, 6, and 8 ova respectively. In all, except the first lot, were white, but well-formed, embryos.

Diet. Examination of ten stomachs revealed the following: 6 grasshoppers, 1 pigmy locust, 1 mantid, 2 crickets, 1 dragonfly (with an estimated wing spread of three inches), 1 leafhopper (Homoptera), 1 moth, 2 caterpillars, and 2 spiders. Mr. F. G. Werner, to whom I am indebted for the identifications, expressed surprise that so small a species of skink should be capable of overpowering prey so large as many of the orthoptera proved to be.

Parasites. Nematodes (Cosmocercidae) were present and preserved, also larval Spiruroidea which Dr. Lucker suggests are not parasitic on this skink but were introduced with arthropod prey.

Habitat. In the grass fringing the footpaths.

Mabuya varia varia (Peters)

Euprepes (Euprepis) varius Peters, 1867, Monatsb. Akad. Wiss. Berlin, p. 20: Tete, Mozambique.

♀ (M. C. Z. 47620) S. Kinangop, K. C. 27.x.38.
♂ (M. C. Z. 47621) Ujiji, T. T. 13.iii.39.
♀ (M. C. Z. 47622) Kitaya, T. T. 3.iv.39.
♂ ♀ (M. C. Z. 47623) Mikindani, T. T. 18.iv.39.
♀ (M. C. Z. 47624) Mbanja, T. T. 27.iv.39.

Seen also at Lindi and on Nchingidi Plateau.

Native names. Jagasi (Kikuyu); *namkwakwa* (Kiyao); *liwalawahi namahonta* (Kimakonde at Kitaya); *mjusi islam* (Kimakonde at Mbanja). The Konde and Yao names are not specific, however.

Variation. Midbody scale-rows 32–34; dorsals tricarinate; supranasals in contact; prefrontals separated; supraoculars 4–4; supraciliaries 4–5.

Measurements. Not exceptional.

Breeding. All four females are gravid, and in only the Kinangop skink do the ova not contain embryos.

Enemies. One recovered from the stomach of a hawk (*Kaupifalco monogrammica*) at Mbanja, two others from wolf snakes (*Lycophidion c. capense*) at Mbanja and Lindi, while a third was chased past my feet by a sand snake (*Psammophis s. sibilans*) as recorded under that species.

Mabuya striata (Peters)

Tropidolepisma striatum Peters, 1844, Monatsb. Akad. Wiss. Berlin, p. 36: Mozambique.

♂ (M. C. Z. 47625) Mabira Forest, U. 5.xi.38.
♀ (M. C. Z. 47626) Budongo Forest, U. 5.xii.38.
♀ (M. C. Z. 47627) Bundibugyo, U. 21.xii.38.
♂ (M. C. Z. 47628) Mihunga Ridge, U. 17.i.39.
♂ (M. C. Z. 47629) Nyakabande, U. 27.i.39.
♂ (M. C. Z. 47630) Bugoie, B. R. 8.ii.39.
3 (M. C. Z. 47631) Kisenyi, B. R. 10.ii.39.
8 (M. C. Z. 47632–5) Idjwi Id., B. C. 16.ii.39.
♂ (M. C. Z. 47636) Kitaya, T. T. 28.iii.39.
♂ ♀ (M. C. Z. 47637–8) Mikindani, T. T. 18.iv.39.
♂ ♀ (M. C. Z. 47639–40) Nchingidi, T. T. 10.v.39.

See also at Ujiji, Lindi, Siga, Amboni, and on Magrotto Mtn.

Native names. Munya (Luganda and Lutoro); *kistumbu* (Luamba); *macherevera* (Lulega); *liwalawahi namahonta* (Kimakonde); *namkwakwa* (Kiyao); *nangwagwa* (Kimawiha); *ghondo* (Kisambara).

Variation. Midbody scale-rows 34–38; dorsals with 3–5–7 keels of which the median 3 only are prominent; supranasals in contact and prefrontals separated except in two (Idjwi and Nchingidi) skinks; supraoculars 4–4; supraciliaries 2–6.

Measurements. Largest ♂ (M. C. Z. 47636) measures 252 (97 + 155) mm., largest ♀ (M. C. Z. 47638) 200 (97 + 103) mm., but tail of latter regenerated.

Diet. Lygaeus bug, golden chrysomelid beetle, and grasshopper.

Enemies. One recovered from the stomach of a wolf snake (*Lycophidion c. capense*) at Ujiji.

Parasites. On Idjwi Island even very young skinks harboured large nematodes (Cosmocercidae) in stomach and intestines.

Habitat. On house in Mabira; rare at Budongo; common only in vicinity of native huts on Mihunga; in garden rubbish and on tree at Kisenyi; one shot twelve feet up a hardwood tree at Kitaya, while at Nchingidi two were shot when basking on tree trunks at a height of twenty feet from the ground. These trees were in forest clearings which had been made by refugee natives during the World War and subsequently abandoned on orders from the Forestry Department.

It was interesting to note the adaptability of this essentially savanna species which is accompanying man in his incursions into primary forest.

Riopa fernandi (Burton)

Tiliqua fernandi Burton, 1836, Proc. Zool. Soc. London, p. 62: Fernando Po.

♀ ♀ (M. C. Z. 47641–2) Budongo Forest, U. 24.xi.38.
♂ (M. C. Z. 47643) Bundibugyo, U. 21.xii.38.

Native names. *Ngurukisi* (Lutoro); *korukutendi* (Luamba).

Variation. Midbody scale-rows 34–35, and in other respects entirely typical.

Measurements. The ♂ measures 226 (116 + 110) mm., the larger ♀, 261 (138 + 123) mm.

Breeding. Ova small in both these large females, testes large in the male.

Diet. Orthoptera in one, stomachs of the others empty.

Parasites. Female nematodes (Ascaridoidea, probably Cosmocercidae) present in Bundibugyo skink.

Defence. One, which I caught beneath a log, threatened to bite but made no sound either then or later in camp when it was provoked.

Riopa sundevallii (Smith)

Eumices (*Riopa*) *sunderallii* (sic) A. Smith, 1849, Ill. Zool. S. Rept., App., p. 11: Natal, South Africa.

1 (M. C. Z. 47644) Butiaba swamp, U. 5.xii.38.
1 (M. C. Z. 47645) Mikindani, T. T. 14.iv.39.
2 (M. C. Z. 47646) Mbanja, T. T. 1.v.39.
6 (M. C. Z. 47647) Nchingidi, T. T. 13.v.39.
1 (M. C. Z. 47648) Siga Caves, T. T. 10.vi.39.
2 (M. C. Z. 47649) Amboni Estate, T. T. 19.vi.39.
4 (M. C. Z. 47650) Magrotto Est., T. T. 1.vii.39.

Native names. *Chiyoweja mihiongo* (Kimakonde at Mikindani); *liwalawahi* (Kimakonde at Mbanja); *kitowa waimi* (Kisambara).

Variation. Midbody scale-rows 26–28; supranasals in contact; prefrontals separated; supraoculars 4–4; supraciliaries 6–8.

Measurements. Largest ♂ (M. C. Z. 47650) measures 196 (110 + 86) mm., largest ♀ (M. C. Z. 47649) 220 (140 + 80) mm., youngest (Butiaba) 79 (45 + 34) mm.

Defence. From the stomach of a sand snake (*Psammophis s. sibilans*) I recovered the tail of a Sundevall's skink, tangible evidence of the advantage derived from a readily detachable tail. This was at Nchingidi, where these lizards were found both without and within the rather dry forest.

Riopa pembanum (Boettger)

Lygosoma (*Riopa*) *pembanum* Boettger, 1913, in Voeltzkow, Reise in Ostafrika, **3**, p. 350, pl. xxiv, figs. 4–5: Pemba Island.

3 (M. C. Z. 47651–3) Likoni, K. C. 25.vii.39.

Variation. Midbody scale-rows 24–26, and in other respects entirely in agreement with seven cotypes recently received from Pemba.

Habitat. These sandy-yellow young were taken beneath piled palm fronds in a coconut plantation half-a-mile from the ferry landing opposite Kilindini. They constitute the second record of the occurrence of this species on the mainland.

LYGOSOMA KILIMENSE Stejneger

Lygosoma kilimensis Stejneger, 1891, Proc. U. S. Nat. Mus., **14**, p. 405: Mt. Kilimanjaro, Tanganyika Territory.

Lygosoma gromieri Angel, 1925, Bull. Mus. Hist. Nat. Paris, **31**, p. 419: Tsavo, Kenya Colony.

? *Lygosoma (Siaphos) compressicauda* Witte, 1933, Revue Zool. Bot. Africaine, **23**, p. 175, figs. 1–4: Sandoa, Belgian Congo.

? *Siaphos dewittei* Loveridge, 1934, Copeia, p. 184: n.n. for *compressicauda* de Witte (not of Werner, 1897) preoccupied.

7 & eggs (M. C. Z. 47654–6) Magrotto Mtn., T. T. 1–15.vii.39.

Synonymy. L. gromieri was described as having a pair of supranasals but no frontonasal and was consequently referred to *Riopa*, then regarded as a subdivision of *Lygosoma*. Actually I believe it to represent an aberration in which the frontonasal is divided so as to simulate a pair of supranasals. It will be noted that a similar condition occurs in 2 of the 128 topotype *L. bloehmanni* (*vide infra*), and if it occurs as a rare variant in one member of the group it is not unreasonable to assume that it may occur in another, as *gromieri* differs from *kilimense* in no other respect I refer it to the synonymy. In reply to a query regarding the type locality, Mons. Angel, with customary kindness, replied in a letter dated November 13, 1937, that Gromier had informed him that the skink was taken on a termitarium near Tsavo station. As the station is beside the Tsavo River which drains the Kyulu and Ongolea Rivers which descend from Kilimanjaro, its geographical location in the arid Tsavo district does not seem unreasonable.

The description of *L. compressicauda* Witte, which I renamed *dewittei* differs in no way from our *kilimense* material, some of the series possessing regenerated tails apparently just as compressed as that of the holotype of *compressicauda*. If my conclusion is correct then we are confronted with an amazing extension of range, *circa* 1500 miles, for Sandoa is not far from the border of Angola. A similar case of discontinuous distribution is provided by this skink's chief enemy, *Lycophidion meleagris*, which is also known only from the Congo-Angola region in the west and the Usambara-Uluguru Mountains in the east.

Variation. Midbody scale-rows 22–24; supraciliaries 7–8; fingers 5; toes 5; lamellae beneath fourth toe 14–15.

Measurements. Largest ♂ (M. C. Z. 47655) measures 156 (67 + 89)

mm., larger ♀ (M. C. Z. 47656) 129 (60 + 69) mm., a hatchling (M. C. Z. 47654) 54 (27 + 27) mm.

Breeding. On July 1 a ♀ held small ova, another 4 eggs almost ready for deposition. On July 10, 4 eggs, measuring 14 x 11 mm., and holding embryos on the point of hatching, were found in leaf mold between the buttress roots of a giant tree. On July 12, 4 eggs, measuring 13.5 x 11 mm., and two clutches so recently hatched that the shells were still soft and fresh, were found in a similar situation.

Enemies. Two eggs and the end of a tail of one of these skinks were recovered from the stomach of a wolf snake (*Lycophidion meleagris*).

Defence. On being picked up, only one skink of the entire series attempted to bite, and that but feebly.

Habitat. All were taken in deep forest between the buttress roots of trees, in which situation their eggs and enemy were also unearthed.

Lygosoma grauei grauei Sternfeld

Lygosoma graueri Sternfeld (part), 1912, Ergebn. Deutschen Zentral-Afrika-Exped., **4**, p. 240, fig. 3, and *quinquedigitata*, p. 241, pl. vi, fig. 5: Karisimbi and vicinity, Belgian Ruanda-Urundi.

19 (M. C. Z. 27657–66) Mubuku Valley, U. 29.xii.38–7.i.39.

Variation. Midbody scale-rows 22–24; supraciliaries 7–8; fingers 5; toes 5; lamellae beneath fourth toe 8–10. The fingers in all are well developed and show no tendency towards the race *quattuordigitata* Sternfeld, 1912, of the Rugege Forest.

Coloration. Above, much as in *meleagris*, but very different below and without such marked sexual dichromatism, viz. Below, whitish, each scale with a central black spot, these spots forming longitudinal rows; preanal region and hind limbs of adults salmon pink and less spotted; spotting in adult males like that of females but denser though the throat is not black as in *meleagris*.

Measurements. Largest ♂ (M. C. Z. 47659) measures 160 (60 + 100) mm., largest ♀ (M. C. Z. 47660) 166 (65 + 101) mm., but both surpassed in length from snout to anus by ♂ ♂ of 67–68 mm., and ♀ ♀ of 72–73 mm. with regenerated tails. Young hatchling (M. C. Z. 47657) 51 (25 + 26) mm.

Breeding. Between January 1–7 five females examined were in all stages of pregnancy, pairs of eggs in the most advanced measured 10 x 5, and 11 x 5.5 mm. respectively. Doubtless many of the eggs

listed under *L. meleagris* are those of *graueri* a point which can be determined only by dissection of those containing embryos with digits developed.

Diet. Ten stomachs revealed the following: 1 spider; 2 small mites, 1 rose beetle, 1 tenebrionid beetle, 2 weevils, 1 beetle larva — probably a wood borer, 2 grasshoppers, 3 moths, 1 large worker ant, 1 small bee, 2 fern sporangia — presumably ingested with prey.

Habitat. These skinks were found about the roots of ferns in the wet forest, their favorite habitat being on the east side of large trees, preferably those with buttress roots. Here they enjoyed the maximum benefit from the few hours of sunshine which filtered through the forest canopy, and the powdery loam tended to be drier for the frequent rainstorms came mostly from the west. To find these very secretive skinks it is first necessary to cut away the ferns which are massed about the base of almost every tree, this done the mat of fern roots which carpets the forest floor may be rolled back so that the skink, or skinks, are exposed. They burrow quickly into the powdery subsoil, though not so active in escaping as *Riopa sundevallii* would be under similar circumstances. This is probably to be attributed to the lower temperature prevailing in the Mubuku Valley of Ruwenzori at 7000 feet.

Lygosoma meleagris Boulenger

Plate 4, fig. 3.

Lygosoma meleagris Boulenger, 1907, Ann. Mag. Nat. Hist. (7), **19**, p. 488: Mubuku Valley, 7000 feet, Ruwenzori Mountains, Uganda.

Siaphos meleagris helleri Loveridge, 1932, Proc. Biol. Soc. Washington, **45**, p. 113: Bugongo Ridge, 9500 feet, Ruwenzori Mountains, Belgian Congo (*not* Uganda).

Lygosoma (*Siaphos*) *Burgeoni* de Witte, 1933, Revue Zool. Bot. Africaine, **24**, p. 116, figs. 1–2: Kalonge, 6725 feet, Ruwenzori Mountains, Belgian Congo.

40 & eggs (M. C. Z. 47667–700) Mubuku Valley, U. 29.xii.38–7.i.39.

Synonymy. *L. meleagris* was described from a single unsexed individual which, on the basis of its color description, we can confidently assume to be a male. For twenty-five years no second example was recorded. In 1932 I described a female from the western (Congo) side of the range which differed from Boulenger's description in five distinct ways. Eight years later Parker (1940a, p. 267), reporting on a juvenile from 8000 feet, pointed out that the original description of

meleagris was inaccurate in 2, if not 3, of my points, leaving *helleri* as distinguished only by the number of subdigital lamellae (partly bridged by his skink), and coloration.

In the hope that an adequate series of topotypes would shed light on the range of variation to be expected, I visited the Mubuku Valley and there, at 7000 feet, personally captured the series listed above. This material disposed of the remaining differences, embracing the high number of subdigital lamellae of *meleagris* and the low number displayed by the type of *helleri*, and revealing that the striking color differences were only sexual (*vide infra*). It enables me not only to corroborate Mr. Parker's doubts as to the validity of *helleri* but to definitely refer it to the synonymy.

L. burgeoni was differentiated solely on the grounds of coloration and a semidivided nasal. Actually the description of the former corresponds well with some of our topotypes. As to the nasal character, though in our series probably entire, the nasal not infrequently presents the appearance of being divided or semidivided, usually on one side of the head only. It will be recorded that Boulenger described *meleagris* as having the "nostril pierced between two nasals" but on reexamination Parker found that "the nasal is undivided, though an artifact on one side simulates a suture." The recognition of *burgeoni* on this single character, therefore, would appear unjustified.

Variation. Midbody scale-rows 22–24; nostril in an entire nasal though not infrequently (M. C. Z. 47669, 47680, etc.) having the appearance of being divided or semidivided; supraciliaries 5–8; 7 being normal; fingers 4; toes 4; lamellae beneath fourth (i. e. third, as hallux missing) toe 9–12. (Based on examination of 33 skinks only).

Coloration. In life. ♂. Above, dark or black, each dorsal scale with a central or two lateral light flecks; flanks white, usually sharply distinct from back but sometimes sparsely flecked with black. Below, throat mottled black and bluish white; chest, belly, hind limbs, and base of tail salmon red (white in alcohol); rest of tail bluish white heavily mottled with black.

Young ♂ ♂ resemble ♀ ♀ in being yellowish white or uniform pink from chin to base of tail, this tint turning to salmon red as they reach maturity. In alcohol 6 sexed males, ranging from 43–63 mm. from snout to anus, had throats which were white or heavily spotted (progressively so with age), 9 others, ranging from 61–69 mm., had black throats. On the other hand, 14 sexed females, ranging from 52–75 mm., had throats which were pure white, only 3 exhibiting any spotting and then but very few spots.

♀. Above, pale brown, each dorsal scale with a blackish central shaft and the dorsal coloring shading off to translucent pink on base of tail; a dark brown streak from nostril, through eye, to flank a short distance behind the fore limb; flanks spotted. Below, throat yellowish white; sometimes one or two lines of black spots along the sides of chest and belly; rest of under surface, including limbs, to base of tail salmon red, remainder of tail bluish white heavily mottled with black.

Measurements. Largest ♂ (M. C. Z. 47668) measures 196 (68 + 128) mm., largest ♀ (M. C. Z. 47667) 193 (69 + 124) mm., but the latter is surpassed in length from snout to anus by others of from 70–75 mm. with regenerated tails. A hatchling measures 53 (24 + 29) mm.

Breeding. Fourteen females examined were in all stages of pregnancy, a pair of eggs in each of the four most advanced measured 8 x 5, 9 x 5, 10 x 5, and 10 x 6 mm. respectively. Some skinks had already laid for numerous pairs of very fresh eggs, measuring 12 x 8.5 mm., were unearthed (for habitat see *graueri* above). Other eggs were in various stages of development and we uncovered one pair from which a skink had just hatched and its fellow emerged as we watched. Later, in camp, I observed the hatching of two more pairs. To escape from the egg the little skink makes a cut two-thirds the length of one side and involving an end of the shell also. Many such hatched-out shells were collected, usually they were in pairs but sometimes several skinks had resorted to the same spot to lay. The greatest number found in any one spot was 22 in an area of about two inches in diameter. Half of these were fresh and about half consisted of shells from some previous season.

Diet. Ten stomachs revealed the following: 1 centipede, 1 scorpion or pseudoscorpion, 1 spider, 2 mites, 1 woodlouse or sow bug (Isopod), 2 beetles, 2 weevils, 2 grasshopper nymphs, 2 leafhoppers (Homoptera), 2 small flies, 1 midge, 3 caterpillars.

Defence. Only one of the entire series bit on being captured, their surest defence consists in discarding the exceptionally long tail consequently few specimens with unregenerated tails are found.

Habitat. The habitat of this species is fully described under *L. graueri*, for both 5– and 4–toed species occur together. The first three were taken on the day of our arrival during the process of clearing ferns for a camp site. Though usually only one or two are to be found at the base of any one tree, half-a-dozen were encountered among the buttress roots of one giant.

Lygosoma blochmanni Tornier

Lygosoma blochmanni Tornier, 1903, Zool. Jahrb. Syst., **19**, p. 173: Lake Kivu, Belgian Congo.

128 (M. C. Z. 47701–50) Idjwi Id., Lake Kivu, B. C. 16–28.ii.39.

Native name. Kashondanegu (Lulega).

Variation. Except for six examples from Idjwi Island recorded by Sternfeld in 1912, this species is known only from the ♂ and ♀ cotypes. I therefore took the opportunity of securing the above series of topotypes from which, after the tridactyle character of the *entire* series had been checked, I selected fifty specimens for examination in considerable detail and noted the following results.

Midbody scale-rows 20–24, only 2% with the former and 8% with the latter; supraciliaries 5–7, 6 being normal; fingers 3; toes 3; lamellae beneath fourth (i. e. median, as hallux and first toe are absent) toe 8–10. Two males (M. C. Z. 47702, 47728) have the frontonasal divided or with an artifact simulating a division and thus presenting the appearance of possessing a pair of supranasals.

Coloration. In life. ♂. Above, dark brown or black, many scales flecked laterally with yellowish white; tail suffused with pink. Below, throat uniform black, body and fore limbs greenish white, each scale with a dark brown spot; hind limbs and tail brownish pink, each scale spotted with black and white; soles of all four feet black.

Of 27 sexed males it was observed that 14, ranging from 40–48 mm., and 1, of 51 mm. snout to anus, had throats which were white or heavily spotted (progressively so with age), 12 others, ranging from 46–54 mm., had the throats so heavily spotted as to appear black. There is considerable variation in the belly coloring, which may be white, each flank scale, or *all* scales, with a black central spot.

Females differ from the males in substantially the same way as has been described for *L. meleagris*.

Measurements. Largest ♂ (M. C. Z. 47701) measures 139 (50 + 89) mm., but is surpassed in length from snout to anus by ♂ ♂ (M. C. Z. 47721, 47734) of 54 mm., and ♀ ♀ (M. C. Z. 47727, 47737) of 55 mm., with regenerated tails. A hatchling measures 44 (20 + 24) mm., and slightly older skinks, 60 (25 + 35) and 62 (25 + 37) mm.

Breeding. Each of four females examined held either 2 or 3 eggs, measuring 8 x 4 mm. and 9 x 4 mm. respectively.

Diet. Fragments of five centipedes, a scorpion, spider, beetle, and grasshopper.

Enemies. No fewer than twenty-two of these skinks were recovered from stomachs of wolf snakes (*Lycophidion c. ornatum*).

Habitat. More in evidence than either of the two species taken on the Ruwenzori Mountains, for on sunny mornings they might be heard rustling, and occasionally observed basking, among the fallen leaves and short grass fringing the paths in the montane forest.

Ablepharus boutonii africanus Sternfeld

Ablepharus boutonii africanus Sternfeld, 1918, Abh. Senckenberg Nat. Ges., **36**, p. 423: Manda Island and Malindi, Kenya Colony; Pemba Island.

4 (M. C. Z. 47751) Mbanja, T. T. 2.v.39.

Said to occur at Mikindani also, but I failed to find it.

Variation. Midbody scale-rows 22–23.

Measurements. Larger ♂ measures 105 (45 + 60) mm., and ♀, 98 (47 + 51) mm.

Breeding. On May 2, the larger ♀ held 2 eggs measuring 11 x 5 mm.

Diet. Stomachs of two examined by Dr. F. A. Chace held at least six crabs, three being referable to the genus *Sesarma* and three to *Uca*, in addition were unidentifiable remains of some other creature, possibly an arthropod.

Ablepharus wahlbergii (Smith)

Cryptoblepharus wahlbergii A. Smith, 1849, Ill. Zool. S. Africa, Rept., App., p. 10: Natal, South Africa.

21 (M. C. Z. 47752–4) Mikindani, T. T. 24.iii & 12.iv.39.
10 (M. C. Z. 47755–6) Kitaya, T. T. 28.iii–6.iv.39.
5 (M. C. Z. 47757–8) Mbanja, T. T. 26.iv.39.
1 (M. C. Z. 47759) Lindi, T. T. 1.vi.39.
2 (M. C. Z. 47760–1) Mitunga, T. T. 8.v.39.
8 (M. C. Z. 47762–9) Nchingidi, T. T. 10.v.39.

Native names. Not unnaturally, this diminutive skink is thought to be the young of *Mabuya m. boulengeri* and *Riopa sundevallii* by the Yao and Konde at Mikindani and Kitaya.

Variation. Under certain conditions this species appears to produce individuals which are markedly larger than the average. I (1933h, p. 324) had occasion to comment on such a skink from Nyamkolo, Northern Rhodesia. Usually such specimens occur spasmodically with those of average size but on the Rondo Plateau (Mitunga and Nchingidi)

the majority appear to be larger than those on the surrounding coastal plain. Such an increase in size is accompanied by an increase in lamellae beneath the toes and in the number of scales about midbody (which, throughout East Africa are normally 24–26 with 22 (and possibly 20) and 28 occurring as rare variants). To clarify the position I furnish below the data derived from 26 skinks of the coastal plain (1) that they may be contrasted with that derived from 10 examples taken on the Rondo Plateau (2).

(1). Midbody scale-rows 24–26–28, only one with latter number, average 25.2; lamellae beneath fourth toe 13–16, average 14.3; length from snout to anus of six largest 40–51 mm., average 44 mm.

(2) Midbody scale-rows 26–28, only two with lower number, average 27.6; lamellae beneath fourth toe 15–18, average 16.6; length from snout to anus of six largest 33–41 mm., average 36.8 mm.

Diet. A surprisingly large harvestman (Arachnida) in one.

Enemies. Recovered from the stomachs of wolf snakes (*Lycophidion c. capense* and *capense acutirostre*) at Mbanja, from a house snake (*Boaedon l. lineatus*) at Nchingidi.

Habitat. At Mikindani under piles of palm fronds, coconut husks, and other rubbish; at Kitaya beneath heaps of wet weeds taken from, and piled at edge of, a rice swamp. At Mbanja and Mitunga in clearing camp sites beneath mango trees. At Nchingidi these little skinks were commonly seen along the edges of the paths.

Scelotes tetradactylus tetradactylus (Peters)

Sepsina (Rhinoscincus) tetradactyla Peters, 1874, Monatsb. Akad. Wiss. Berlin, p. 374: Zanzibar Coast.

4 (M. C. Z. 47776–9) Nchingidi, T. T. 12.v.34.

Variation. Midbody scale-rows 24; supraciliaries 4 (or 5?); fingers 4; toes 4; lamellae beneath fourth toe 3.

Remarks. The structural characters used by Hewitt to differentiate the southwestern *alberti* (n.n. for *hessei* Hewitt, 1927, not of Boettger, 1887) from *tetradactylus*, which he had not seen, are invalid. Even in our small series of five (including adult from Uluguru Mountains) the frontal may be as broad as (young) or broader than (adult) long, while the relative lengths of the digits appear to be the same as those of *alberti*, which I have not seen. Doubtless *alberti* is a good race of *tetradactylus*, though I do not know how to distinguish them except by the former being said to have the scales margined with black,

whereas in *tetradactylus* of the same size there is a dark central shaft while the margins are pale brown. In adults these dark shafts apparently disappear, being only faintly discernible with a lens.

Coloration. In life. ♀. Above, pale brown, head darker, each dorsal and lateral scale with a median, longitudinal, black shaft, which, by coalescing, form sixteen conspicuous dorsal and dorsolateral lines, those on the flanks being narrower and fainter; tail with similar dark lines on a background of rich ultramarine blue. Below, body and limbs white; tail dull ultramarine with series of dusky lines resulting from a dark streak down the centre of each. See also remarks above.

Measurements. All young or subadult, the largest (M. C. Z. 47776) being only 114 (78 + 36) mm.

Habitat. All taken in damp sandy soil beneath logs lying at the forest edge.

SCELOTES TETRADACTYLUS HEMPTINNEI (Witte)

Plate 4, fig. 1.

Sepsina Hemptinnei de Witte, 1933, Revue Zool. Bot. Africaine, **23**, p. 188: Lukafu, Kundelungu, Katanga, Belgian Congo.

15 (M. C. Z. 47770–5) Ruanda near Ujiji, T. T. 10–15.iii.39.

Variation. Midbody scale-rows 22–24; supraciliaries 4 (or 5?); fingers 4; toes 4; lamellae beneath fourth toe 1–2.

Remarks. This race, which is new for Tanganyika, apparently occupies an intermediate position structurally as well as geographically between the eastern *tetradactylus* and the western *alberti.* De Witte distinguished *hemptinnei* from the former by its supposedly less depressed snout, no such difference exists when direct comparison is made between our types of *hemptinnei* and topotypes of *tetradactylus.*

Adult *hemptinnei* do differ, however, in their slightly more attenuated bodies, their slightly more rudimentary digits as shown also in lamellae reduction, and their slightly longer tails which are bronze, instead of bright ultramarine blue.

These slight differences can best be appreciated by direct comparison, and under these circumstances it would seem advisable to regard *hemptinnei* as a race which has become rather more specialized for its fossorial life than is the typical form.

Coloration. In life. ♀ (M. C. Z. 47770). Above, iridescent bronze, each dorsal scale, excepting the two median series, with a median, longitudinal, black shaft, which go to form six, interrupted, longi-

tudinal lines. Below, throat pinkish (as a result of blood vessels showing through) except on buccal border which is white; rest of undersurface white, each scale with a small, dusky, apical spot, such spots being larger on the tail.

Measurements. Largest ♂ (M. C. Z. 47774) measures 136 (76 + 60) mm., largest ♀ (M. C. Z. 47770) 153 (87 + 66) mm., but both surpassed by others with a length from snout to anus of 85 and 91 mm. respectively, with regenerated tails.

Breeding. In mid-March the testes of the males were large but the ova in five females small, in a sixth were 2 eggs, measuring 10 x 4 mm.

Diet. Two stomachs held seven termites, a cockroach, and a spider.

Habitat. In the slightly damp sandy soil beneath piles of dry or rotting vegetation in the gardens adjacent to the rice fields of Ruanda, from four to six miles east of Ujiji on Lake Tanganyika.

MELANOSEPS — Key to the Species[1]

For more than a decade I have been hoping for an opportunity to secure a series of *Melanoseps* which might enable one to get an idea of the probable extent of variation and sexual dimorphism. The 24 specimens which we have obtained on the Rondo Plateau make it necessary for me to correct my (1933h, p. 326) mistake of synonymizing var. *longicauda* Tornier with the typical form. As the short-tailed type of *ater* was apparently a ♀, it seemed in accordance with the other data then available to postulate that the long-tailed type of *longicauda* was a male.

It now appears from the Rondo series that there is no appreciable sexual dimorphism for the largest ♂ measures 93 + 27 mm., and the largest ♀ 92 + 29 mm. It may be postulated that the genus originated in Tanganyika Territory and has undergone tail reduction in its process of fossorial specialization. If this be accorded priority as the most important character, then increase in midbody scale-rows, which is correlated with increase in size in favourable habitats, can take its place as a secondary development. It is on this suggestion that the following synoptical key is based.

1. Midbody scale-rows 18–20; size small, the maximum length from snout to anus being 93 mm. . . . . .2.
   Midbody scale-rows 22–28; size large, the maximum length from snout to anus being 160–210 mm. . . . . .3.

[1] Eastern forms only. *M. occidentalis* (Peters) of Cameroon omitted. *Melanoseps acontias* Werner, 1913 (1912) is referred to *Scolecoseps*.

2. Length of tail contained 1.7 times in length from snout to anus; range: northeastern Tanganyika . . . . *a. longicauda*
   Length of tail contained 2.6 to 4.6 times in length from snout to anus; range eastcentral (Mpwapwa) to southeast (Nchingidi) Tanganyika . . . . *a. rondoensis* subsp. nov.
3. Midbody scale-rows 22–24; length of tail 2.6 to 4.1 times in length from snout to anus . . . . 4.
   Midbody scale-rows 26–28; length of tail 3.8 times in length from snout to anus . . . . 5.
4. Midbody scale-rows 22; color below from chin to anus whitish with blackish-brown lines resulting from the fusion of a blackish-brown spot on the centre of each scale; maximum length from snout to anus 160 mm.; range: (? Uluguru Mountains, Tanganyika south to) Zambesi . . . . *a. ater*
   Midbody scale-rows 22–24 (only 1 of the 12 types with the lower number); color below from chin to anus pure white in sharp contrast to the plumbeous tail, only occasional scales with a dusky brown spot showing a tendency to form lines; maximum length from snout to anus 166 mm.; range: Matengo Highlands, southwestern Tanganyika . . . . *a. matengoensis* subsp. nov.
5. Color below substantially that of the typical form, viz. from chin to anus pinkish white with brown lines resulting from the fusion of a brown spot on the centre of each scale; range: Uzungwe Mountains, southcentral Tanganyika *a. uzungwensis* subsp. nov.

MELANOSEPS ATER RONDOENSIS subspec. nov.

24 (M. C. Z. 47780–800) Nchingidi, T. T. 11–21.v.39.

One found dead on path between Kiponga and Mitunga, Rondo Plateau, 8.v.39.

Type. Museum of Comparative Zoölogy, No. 47780, an adult ♂ from Nchingidi, 3000 feet, Rondo Plateau, Lindi Province, southeastern Tanganyika Territory. Collected by Arthur Loveridge, May 11–21, 1939.

Paratypes. Museum of Comparative Zoölogy, Nos. 47781–800, being 23 specimens with same data as type.

Diagnosis. As given in preceding key.

Description. Midbody scale-rows 18 (18–20 in paratypes); length of unregenerated tail included in length from snout to anus 3.4

(2.6–4.6) times. Otherwise similar to the typical form though coloration probably paler.

Measurements. Largest ♂ (Type) measures 120 (93 + 27) mm., largest ♀ (M. C. Z. 47781) 121 (92 + 29) mm.

Breeding. In mid-May this female held two spherical eggs measuring about 4 mm. in diameter.

Diet. Pupa of a midge and a click beetle larva in one stomach.

Habitat. In damp sandy soil beneath logs lying at the forest edge. The majority were taken around the periphery of the forest-clearing in which my tent was pitched, and it was across the sandy floor of the latter on the cool day of our arrival that I found the first skink wriggling. The entire series were taken by my two gunbearers and self.

Range. I refer to this race, at least provisionally, two skinks taken under similar habitat conditions at Mpwapwa and the Mkata River in central Tanganyika Territory.

Melanoseps ater matengoensis subspec. nov.

Cotypes. Museum of Comparative Zoölogy, No. 44119, and eleven others in Vienna Museum, from Ugano, Matengo Highlands, west of Songea, Tanganyika Territory. Collected by H. Zerny, 1935–6.

Diagnosis. As given in preceding key.

Description. Midbody scale-rows 22–24 (22 in only one of the twelve cotypes); length of unregenerated tail included in length from snout to anus (2.6 to 4.1 times; coloration (see key) strikingly different from that of the typical form.

Measurements. One cotype ♀ (M. C. Z. 44119) measures 154 (115 + 39) mm., but is surpassed by nine others (Vienna Museum) whose length from snout to anus ranges from 121–166, the unregenerated tails from 30–49 mm.

Melanoseps ater uzungwensis subspec. nov.

Melanoseps ater Loveridge (part), 1933h, Bull. Mus. Comp. Zoöl., **74**, p. 326 (Kigogo, Uzungwe Mountains).

Type. Museum of Comparative Zoölogy, No. 51076, an adult ♀ from Kigogo, Uzungwe Mountains, southern Tanganyika Territory. Collected by Arthur Loveridge, November 22, 1929.

Paratype. Museum of Comparative Zoölogy, No. 51077, a larger ♀ with same data as the type.

Diagnosis. As given in preceding key.

Description. Midbody scale-rows 28 (26 in paratype); length of unregenerated tail included in length from snout to anus 3.8 times. Otherwise like the typical form.

Measurements. Type ♀ (M. C. Z. 51076) measures 136 (108 +28) mm., but is surpassed in length from snout to anus (210 mm.) by the paratype with injured tail.

CHAMAELEONTIDAE

As an offshoot of the Agamidae this specialized family might be placed more appropriately in juxtaposition to the agamas; in the present paper it is left in its old place for convenience of reference and to preserve uniformity with the five previous reports dealing with the herpetological collections which I have made in East Africa.

Chamaeleo senegalensis senegalensis Daudin

Chamaeleo senegalensis Daudin, 1802, Hist. Nat. Rept., **4**, p. 203: Region watered by the Senegal and Niger Rivers, Gambia and Guinea.

2 ♂ ♂ 3 ♀ ♀ (M. C. Z. 47151–2) Ujiji, T. T. 13.iii.39.

Coloration. In life. ♂. Above, pale pinkish brown, crown of head darker; on vertebral line a series of eight rusty-orange blotches; flanks with larger and smaller spots of the same color and a black line from axilla to midbody where it breaks up into a few spots. Below, throat purplish gray, the interstitial skin orange; gular-ventral crest pure white; soles of feet and tail fawn to purplish brown.

In life. ♀. Above, yellow and grass green; on flanks a lateral series of six black-edged white spots, below which is a more or less black-edged white band from axilla to groin. Below, throat green, the interstitial skin orange; gular-ventral crest pure white continued on as a narrow line beneath tail; limbs and anal area pure white.

Measurements. Larger ♂ measures 190 (108 + 82) mm., largest ♀, 240 (135 + 105) mm.

Breeding. On March 13 all three females were gravid, the largest held 60 eggs, each measuring about 7 mm. in diameter.

CHAMAELEO DILEPIS QUILENSIS Bocage

Chamaeleo dilepis var. *Quilensis* Bocage, 1866, Jorn. Sci. Lisboa, **1**, p. 59: Rio Quilo, north of Cabinda, Portuguese Congo.

3 (M. C. Z. 47153–4) Ujiji, T. T. 14.iii.39.

Variation. All are young under 150 mm. in length so that the occipital lobes are of little use in diagnosis, both males, however, have well developed tarsal spurs.

Habitat. One was on a mhoga plant beside the path.

CHAMAELEO DILEPIS DILEPIS Leach

Chamaeleo dilepis Leach, 1819, in Bowdich, Miss. Ashantee, App., p. 493: Gaboon, *i.e.* French Congo.

3 ♂ 2 ♀ (M. C. Z. 47166–7) Kitaya, T. T. 25.iii.39.
3 ♂ 3 ♀ (M. C. Z. 47168–9) Mikindani, T. T. 18.iv.39.
1 ♀ (M. C. Z. 47170) Lindi, T. T. 26.iv.39.
5 ♀ (M. C. Z. 47171–4) Mbanja, T. T. 27–30.iv.39.
5 ♀ (M. C. Z. 47175–6) Nchingidi, T. T. 12.v.39.
1 ♀ (M. C. Z. 47177) Magrotto Mtn., T. T. 1.vii.39.

Native names. *Naluii* (Kiyao); *naluihu* (Kimakonde); *nalwiu* (Kimawiha); *luvi* (Kisambara).

Measurements. Largest ♂ (M. C. Z. 47168) measures 229 (110 + 119) mm., largest ♀ (M. C. Z. 47171) 390 (195 + 195) mm. This and another female from Mbanja are really gigantic, surpassing by 60 mm. the largest (Morogoro) females I have ever taken elsewhere. It is difficult to believe that they are subspecifically the same as the gravid females of 190 mm. from localities immediately north and south of Mbanja and in no way dissimilar climatically or topographically.

Breeding. Though females were taken in all localities they were noticeably gravid only at Kitaya, Nchingidi, and Magrotto, on the dates given above.

CHAMAELEO DILEPIS IDJWIENSIS subspec. nov.

Plate 5, fig. 2.

7 ♂ 11 ♀ 4 yng. (M. C. Z. 47155–65) Idjwi Id., B. C. 24–28.ii.38.

Type. Museum of Comparative Zoölogy, No. 47155, an adult ♂ from Upper Mulinga River, Idjwi Island, Lake Kivu, Belgian Congo. Collected by Arthur Loveridge, February 24–28, 1939.

Paratypes. The rest of the series listed above and having the same data as the type, many of them coming from the coffee plantations further down the mountain.

Native name. Lumvu (Lulega).

Diagnosis. Intermediate between *dilepis* and *roperi*, agreeing with *d. dilepis* in possessing large occipital lobes but differing in the absence of a tarsal process (spur), in this latter respect agreeing with the small-lobed *d. roperi*. Both sexes have the spines of the gular crest more strongly developed than is the case with *d. dilepis*.

On first seeing females of this form I was struck by their handsome coloring (see below, and pl. v, fig. 2) which seemed strikingly different from any that I had previously encountered in East Africa.

Coloration. In life. ♂ Type. Above, light or dark green mottled and spotted with black; dorsum with seven, green-centered, black, saddle-like markings, ten or more on tail; from axilla to groin a white lateral band which, anteriorly, is bordered above and below by a few scattered orange-red spots; occipital flaps posteriorly pure white. Below, yellowish, throat with dark longitudinal lines and spotted with orange-red; gular crest dark brown; ventral crest white.

In life. ♀ Paratype. Above, light or dark green conspicuously marked with numerous large orange spots; occipital flaps posteriorly yellowish white. Below, dark green, interstitial skin of throat bright yellow spotted with orange-red; gular crest brown; ventral crest white. (Noticeably no white lateral band.)

Measurements. Total length of type ♂, 250 (130 + 120) mm., of paratype ♀ (M. C. Z. 47156) 270 (140 + 130) mm., of young (M. C. Z. 47157) 66 (35 + 31) mm.

Breeding. Four young, with dimensions approximating those given above, were brought in. Ten of the females are conspicuously gravid, the smaller eggs measuring 8 mm. in diameter.

Diet. One stomach held six green caterpillars and a *Mylabris* beetle.

Defence. Though, in protest at being photographed, the large female bit a forefinger and hung on persistently, the teeth failed to break the skin.

CHAMAELEO BITAENIATUS BITAENIATUS Fischer

Chamaeleo bitaeniatus Fischer, 1884, Jahrb. Hamburg. Wiss. Anst., **1**, p. 23, pl. ii, figs. 7a–b: Lake Naivasha, Kenya Colony.

17 (M. C. Z. 47178–90) Mabira Forest, U. 7–19.xi.38.
16 (M. C. Z. 47191–9) Kibale Forest, U. 9–19.xii.38.
1 (M. C. Z. 47200) Bundibugyo, U. 26.xii.38.

Native names. *Nawoloru* (Luganda); *waruju* (Lutoro); *ameuli* (Luamba).

Coloration. In life. ♂. Mabira. Above, pale blue green; centre of casque pale blue; side of head with bright yellow horizontal streaks; dorsal crest orange; flank with a light lateral line partially obscured by three irregular vertical bars of brick red. Below, throat yellow margined with white, a very distinct black gular spot; ventral crest white; inner side of limbs and tail lemon yellow.

In life. ♀. Mabira. Above, slightly olivaceous dirty white; dorsal crest olive; flanks with a white lateral line immediately below which is an interrupted olive line which commences at the orbit. Below, a distinct black gular patch; throat, ventral crest, inner side of limbs, and tail, more or less white.

Measurements. Largest ♂ (M. C. Z. 47191) measures 152 (80 + 72) mm., largest ♀ (M. C. Z. 47178) 140 (80 + 60) mm., smallest (Kibale) 64 (34 + 30) mm.

Breeding. In November small embryos present, in December larger ones.

Chamaeleo bitaeniatus ellioti Günther

Chamaeleon Ellioti Günther, 1895, Ann. Mag. Nat. Hist. (6), **15**, p. 524, pl. xxi, fig. A: Bugoye, eastern foot of Ruwenzori Mtns., Uganda.

25 (M. C. Z. 47201–9) Bugoye, U. 26–28.xii.38.
3 (M. C. Z. 47210–1) Mihunga, U. 9–19.i.39.
3 (M. C. Z. 47212–3) Nyakabande, U. 26.i.39.
6 (M. C. Z. 47214–5) Mushongero, U. 1.ii.39.
67 (M. C. Z. 47216–50) Kiraga, B. R. 8–12.ii.39.

Native names. *Waruju* (Lutoro); *nyarungu* (Lukonjo); *lumvu* (Lukiga).

Variation. Though formerly, with inadequate material, I regarded this form as indistinguishable from typical *bitaeniatus*, now, with a good series of topotypes one can separate *ellioti* by its longer gular-ventral and dorsal crests, the latter being brick red or dried-blood red (orange in typical *bitaeniatus*). *C. b. ellioti* increases in size as one proceeds southwards and probably presents an average difference, a matter which I hope to deal with at some future time.

Coloration. This is likely to play so important a part in any future revision of the races that I took pains to record it in detail.

In life. ♂. Bugoye. Above, pale blue green; centre of casque pale blue or yellow; side of head with, or without, a few ill-defined horizon-

tal streaks; dorsal crest brick red; flank with a distinct light lateral line bordered below by red while both above and below irregular mottlings of brick red may be present or absent. Below, throat yellow, or blue with a central shaft of yellow, *one* or *two* black, or blue, gular spots; ventral crest white; inner side of limbs and tail lemon yellow.

In life. ♀. Bugoye. Above, light green or yellow; dorsal crest reddish; flank with a white lateral line bordered below by rufous, sometimes a second, but narrower, white line extending from axilla to groin. Below, throat and under surface, including limbs, light green or yellow, *one*, though normally *two*, black gular spots; ventral crest and soles of feet white.

In life. ♂. Kiraga. Above, a very bright green; centre of casque grass green; sides of mouth showing a little yellow; dorsal crest dried-blood red; flank with a light lateral line partly obscured by a very broad dried-blood-red band which tends to throw off six, indistinct, vertical bars to unite with the dorsal crest. Below, throat uniformly green *without black gular spots;* ventral crest *bright yellow* anteriorly, only white posteriorly from midbody; inner side of limbs *bright yellow;* underside of tail green, browner posteriorly.

In life. ♀. Kiraga. Above, light green; supraoccipital and dorsal crests rusty brown; flank with a white lateral line bordered below by an obsolescent, interrupted, rusty brown band anteriorly extending to the orbit. Below, throat pale green *without black gular spots;* ventral crest pure white; inner side of limbs white; tail white anteriorly, brown posteriorly.

Measurements. Largest Uganda ♂ (M. C. Z. 47201) measures 149 (81 + 68) mm., largest Uganda ♀ (M. C. Z. 47215) measures 171 (90 + 81) mm. Ruanda series not measured.

Breeding. On January 18, a very small young measuring 50 (26 + 24) mm. was found on sedges in swamp at Mihunga. On January 26 and February 1 *all* eight females were gravid, the ova being small in only one.

Enemies. One recovered from the stomach of a kestrel (*Falco t. rufescens*) shot at Mihunga.

CHAMAELEO BITAENIATUS ? BERGERI Sternfeld

Chamaeleon bitaeniatus bergeri Sternfeld, 1912, Wiss. Ergebn. Deut. Zent.-Afrika-Exped. 1907–1908, **4**, pp. 250–253, pls. viii, fig. 4, and ix, fig. 5: "Sirgoi" *i.e.* Sergoit, Kenya Colony.

♂ ♀ (M. C. Z. 47251–2) S. Kinangop Plateau, K. C. 27.x.38.

Native name. *Kimbu* (Kikuyu).

Variation. These chameleons, taken at 10,000 feet, though adult are much too small to be referred to *C. b. höhnelii* which they closely resemble except for two conspicuous rows of large, flat plates on either flank. A female chameleon from Thomson's Falls, western Aberdare Mountains, which one might expect to be subspecifically similar to the Kinangop reptiles, was recently referred by Parker (1940a, p. 269) to *C. b. leikipiensis* Steindachner, a name used to describe a chameleon taken with *höhnelii* at the same type locality and altitude — 6000 feet, and therefore invalid as a race of *bitaeniatus*.

C. b. bergeri Sternfeld was based on a single male from Sergoit, a locality given as 6000–8000 feet. Heretofore I have considered it a synonym of *höhnelii* but prefer to apply it to these chameleons rather than propose another name at this time. I might add that the possibility of identifying the Kinangop chameleons with *C. b. schubotzi* (Mt. Kenya), *C. b. altaeelgonis* (Mt. Elgon, 10,500 feet), or with *C. b. rudis* (Mt. Ruwenzori, 10,000 feet) has been rejected after careful consideration and comparison with topotypes of all three. Two races are present on each of these mountains and on Kenya one (presumably from high altitude) appears subspecifically identical with the Kinangop chameleons.

Measurements. Total length of ♂, 121 (62 + 59) mm., of ♀, 146 (78 + 68) mm. The holotype ♂ of *bergeri* is 128 (64 + 64) mm. according to Sternfeld who assumed that it was not fully adult.

Habitat. I found these in long grass among rank vegetation on the banks of the Chania River.

Chamaeleo fischeri matschiei Werner

Chamaeleon matschiei Werner, 1895, Verh. Zool.-Bot. Ges. Wien, **45**, p. 192: Usambara Mountains, Tanganyika Territory.

♂ (M. C. Z. 47253) Magrotto Mtn., T. T. 5.vii.39.

Native name. *Luvi* (Kisambara, but generic only).

Synonymy. In the absence of typical *f. fischeri* from Nguru Mtn., I continue to use the name *matschiei* though it may well be a synonym of *fischeri*.

Measurements. Total length 332 (17 + 125 + 190) mm., the first measurement in parenthesis being the projecting horns.

Coloration. In life. ♂. Above, a rich, dark, velvety green, edge of

casque and vertebral ridge black; horns horn-color; tail barred with darker. Below, inner aspect of limbs and underside of tail grayish; soles of feet creamy yellow. Turns dark black all over when molested.

CHAMAELEO XENORHINUS Boulenger

Plate 6, fig. 2.

Chamaeleon xenorhinus Boulenger, 1901, Proc. Zool. Soc. London, **2**, p. 135, pl. xii: Eastern Ruwenzori Mountains, 6000 feet, Uganda.

♂ (M. C. Z. 47254) Mubuku Valley, U. 2.xii.38.
♀ (M. C. Z. 47255) Mihunga Ridge, U. 18.i.39.

These specimens are topotypes from 7000 and 6000 feet respectively. In addition to the original pair only four others have been recorded in the literature over a period of forty years.

Coloration. In life. ♂. Above, head and flanks pale bluish green, each scale standing out against the purplish brown venations of the skin; vertebral ridge and upper side of tail (except for its green tip) purplish brown with four darker saddle-like markings on dorsum and eight on tail; fore limbs pale yellow green; hind limbs dark moss green interspersed with purplish brown. Below, chin and jaws tinged with green, otherwise dirty white; tail mottled with greenish white and purplish brown.

In life. ♀. Above, head and saddle-like markings a soft, olive, moss green.

Measurements. Total length of ♂ 209 (8 + 85 + 116) mm., the first measurement in parenthesis being the projecting horn; largest ♀ 210 (95 + 115) mm.

Breeding. On January 18 the female held 6 eggs, each measuring about 15 x 10 mm.

Diet. The female's stomach held two flies, two plant beetles, a metallic wood-boring beetle, a caterpillar, and a stink bug.

Parasites. Two nematodes (*Entomelas chamaeleonis*) present in mesentery, apparently lungs, of male, and several in rectum of female.

Habitat. Though strenuous efforts were made to obtain a series of these chameleons they met with no success, the female being the only one brought in. It seems probable that they are dwellers in the forest canopy. The male was found crawling over vegetation piled at the periphery of our camp clearing in the heart of the forest. It was obviously ailing and died within half-an-hour, it might possibly have been injured by the staves of porters slashing down the ferns when

making the clearing a few days previously though there were no signs of external injury to support such an idea, more probably parasitization was responsible.

CHAMAELEO MELLERI (Gray)

Ensirostris melleri Gray, 1864, Proc. Zool. Soc. London, p. 478, pl. xxxii, fig. 1: Mountains in the interior of East Africa.

4 (M. C. Z. 47256–9) Mikindani, T. T. 9 & 21.i.39.

Native names. Litagamulu (Kiyao); *natendalechi* (Kimakonde at Mikindani); *nandendereji* (Kimakonde at Mbanja); *naliumondo* Kimawiha).

Measurements. Larger ♂ measures 555 (7 + 228 + 320) mm., and ♀ 500 (6 + 244 + 250) mm., their horns obviously worn down as in the much younger specimens they project 10 and 12 mm. beyond the snout.

Habits. Mr. Kent of the Public Works Department at Lindi, told me that one of these giant chameleons lived for a long time in a tree above his quarters. He said that each day about noon, with surprising regularity, it went to the end of a certain branch and defaecated. It was the sight of the accumulated droppings in one spot which attracted his attention to the reptile's routine.

Habitat. Though occurring on mountains this is not a montane species for my camp at Mikindani was almost at sea level and I captured the large (non-breeding) male in an acacia just behind my tent. The three others were brought in by local Wamawiha.

CHAMAELEO JOHNSTONI JOHNSTONI Boulenger

Plate 6, fig. 1.

Chamaeleon johnstoni Boulenger, 1901, Proc. Zool. Soc. London, **2,** p. 136 pl. xiii: Eastern Ruwenzori Mountains at 6000 feet, Uganda.

1 ♂ 1 ♀ (M. C. Z. 47260–1) Mubuku Valley, U. 1.xii.38.
3 ♂ 3 ♀ (M. C. Z. 47262–7) Mihunga Ridge, U. 9–21.i.39.
3 ♂ 3 ♀ (M. C. Z. 47268–73) Mushongero, U. 1.ii.39.
7 ♂ 6 ♀ (M. C. Z. 47274–83) Nyondo, nr. Kisenyi, B. R. 8.ii.39.

Native names. Nyampimpina (Lutoro); *nyarungu ya pembi* (Lukonjo for male); *nyaruju* (Lukiga for male, the hornless female being known by the generic name of *Lumvu*).

Coloration. In life. ♂. Mihunga (topotype). Above, light to dark moss green, head a lighter, more yellowish green with dark spots on

casque and five sepia brown bands on side radiating outwards from the eyeball; vertebral line with fourteen pairs of saddle-like black blotches of which the first and second are continued on flanks as an ill-defined marbled band with bright burnt-orange centre, the third and fourth similar but without the orange, these four are all on the dorsum, the remaining ten on the tail; limbs spotted with black, each spot consisting of a dusky centre and black outer ring. Below, paler with a faintly indicated white ventral line; inner side of limbs dirty white.

Measurements. Largest ♂ (M. C. Z. 47268) measures 267 (25 + 120 + 122) mm. the first measurement in parenthesis being the projecting horn; largest ♀ (M. C. Z. 47269) measures 265 (135 + 130) mm.

Diet. One stomach held a grasshopper, striped coccinelid, banana snail, and a second snail 10 mm. in diameter, others held snails.

Habitat. I captured one ♀, which was at a height of twelve feet from the ground, in a small tree beside the path. The Nyondo series were brought down to my camp at Kiraga, where they are said not to occur, by pupils of the Catholic Mission. It appears probable that other collectors who labeled their *johnstoni* material as from "Kisenyi" obtained them from natives who captured them up the mountain.

BROOKESIA SPECTRUM BOULENGERI (Steindachner)

Plate 5, fig. 1.

Rhampholeon boulengeri Steindachner, 1911, Anz. Akad. Wiss. Wien, p. 178: Rainforest behind sandhills, northwest of Lake Tanganyika, Belgian Congo.

1 (M. C. Z. 47296) Mihunga, Ruwenzori Mtns., U. 18.i.39.
3 (M. C. Z. 47297–9) Upper Mulinga, Idjwi Id., B. C. 20.ii.39.

Native names. Nyampimpina (Lutoro); *lumru* (Lulega). Both Batoro and Balega regard these pigmy chameleons as the young of the larger *Chamaeleo*, and therefore do not differentiate them by name.

Distribution. The Mihunga record is the first for this species from Uganda. I take this opportunity of pointing out that these represent *boulengeri* of Steindachner and Sternfeld, not of Schmidt and Witte, for though Schmidt (1919, p. 595) pointed out that there were probably two forms in Central Africa, he applied the wrong name to his sixty-three females from the Ituri, these represent *B. s. affinis* (Steindachner), type locality Beni, Ituri region.

Variation. In making both *affinis* and *boulengeri* races of *spectrum* I am influenced by the fact that both, except for their much shorter tails, differ only from the typical form in a number of average characters, *viz.* the even shorter rostral process, the less developed or even absent supraciliary crest's flexible process, the flatter parietal region, the casque being even less elevated posteriorly, and the shorter isolated spines at the base of the bicuspid claws, which Steindachner apparently overlooked, stating that they were absent. The two forms are geographically and structurally but stages in the evolutionary development from the more simple *platyceps* of Nyasaland to the better equipped *spectrum* of the French Congo and Cameroon.

Measurements. Larger ♂ measures 64 (48 + 16) mm., and ♀ measures 61 (47 + 14) mm. Both from Idjwi Island, Lake Kivu.

Breeding. Though so small, 49 and 61 mm. respectively, both Mihunga and Mulinga females were gravid, the latter holding 3 spherical eggs measuring about 6 mm. in diameter. The eggs in the former were damaged.

Diet. Two stomachs held many small flies, a small cockroach, spider and woodlouse.

Habitat. The Uganda female was struck by a hoe as we were digging out a very dry and rotten clump of sedge roots at the base of a giant wild banana growing on the banks of the small stream which meanders through the swamp at the base of Mihunga Ridge. Some yolky masses were ruptured by the hoe and it occurred to me that if the species is oviparous, the female may have burrowed into the powdery roots to lay, alternately it is feasible to suppose that it had fallen in unnoticed.

BROOKESIA BREVICAUDATA (Matschie)

Chamaeleon (Brookesia) brevicaudata Matschie, 1892, Sitz. Ges. Naturf. Berlin, p. 107: Derema, Usambara Mountains, Tanganyika Territory.

1 (M. C. Z. 47300) Nchingidi, Rondo Plateau, T. T. 12.v.39.

Distribution. This interesting record helps to bridge the gap in the distribution of this species, heretofore known from the Shire Highlands in Nyasaland (*brachyurus*), otherwise only north of the Rufigi River in Tanganyika Territory.

Variation. The only African *Brookesia* with a beard-like 'tuft' of scales forming a flexible process on the chin.

Enemies. Recovered from the stomach of the Usambara green snake (*Chlorophis macrops*).

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EXPLANATION OF PLATES

PLATE 1

PLATE 1

Map showing Principal Collecting Localities

1938

Landing at Mombasa (25.x), except for a stopover at Naivasha and Kinangop (26–31.x), Loveridge proceeded by rail direct to Jinja (1–5.xi). Thence to Mabira Forest (5–21.xi), Budongo Forest (22.xi–7.xii), Kibale Forest (8–19.xii), Bundibugyo near Bwamba Forest (19–26.xii), Bugoye, foot of Ruwenzori Mountains (26–28.xii) and Mubuku Valley at 7000 ft. (29.xii–).

1939

On leaving Mubuku (–9.i) Loveridge descended down the valley to Mihunga, *circa* 6000 ft. (9–21.i), then back to Bugoye (21–24.i), Nyakabande (25–30.i), Mushongero (30.i–4.ii), returned to Nyakabande (4–8.ii.); Kisenye (8-13.ii), Goma (13–14.ii), Mamvu on Idjwi Island (14–16.ii), Upper Mulinga River on Idjwi (16.ii–6.iii), Uvira (7–8.iii), Ujiji (9–16.iii), Dar es Salaam (18–19.iii), Mikindani (22–24.iii), Kitaya (24.iii–7.iv), Mikindani (7–24.iv), Mbanja (25.iv–6.v), Lake Rutamba (6–8.v), Nchingidi (9–21.v), Lindi (22.v–4.vi), Siga Caves (7–17.vi), Amboni Estate (17–27.vi), Magrotto Mountain (27.vi–21.vii), Tanga (21–23.vii), Likoni opposite Kilindini (24–26.vii).

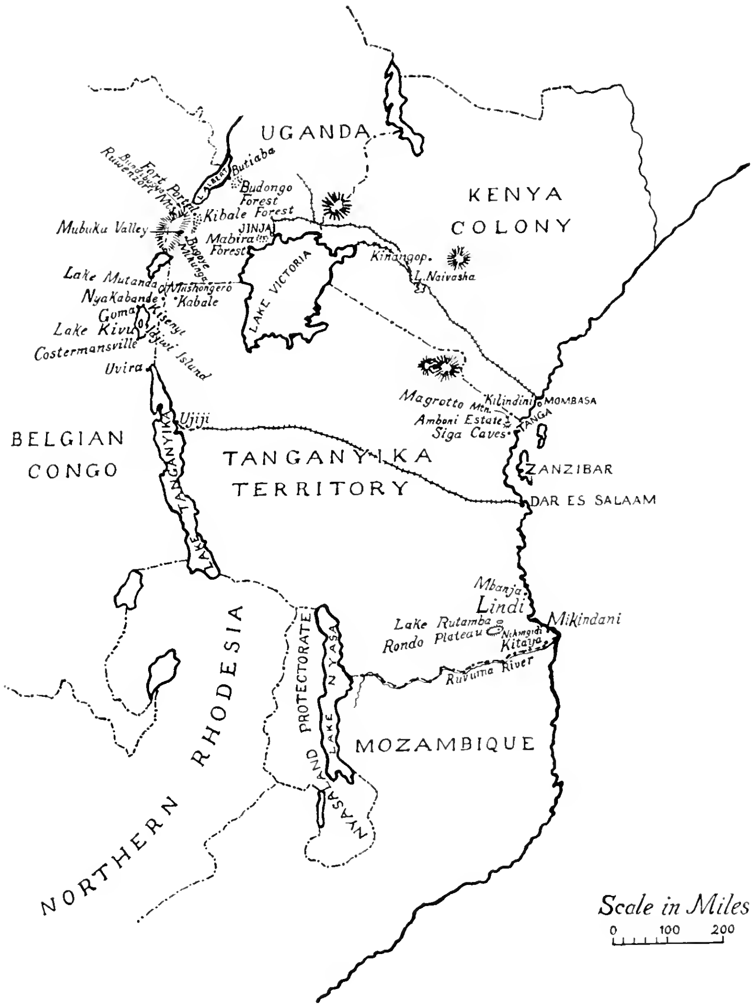
UGANDA
KENYA
COLONY
Butiaba
Budongo
Forest
Fort Portal
Bundibugyo
Ruwenzori Mts.
Kibale Forest
Mubuku Valley
JINJA
Mabira
Forest
Bugoye
Mihunga
Lake Mutanda
Mushongero
Nyakabande
Kabale
Goma
Kisenyi
Lake Kivu
Costermansville
Idjwi Island
Uvira
LAKE VICTORIA
Kinangop.
L. Naivasha
Magrotto Mtn.
Kilindini
MOMBASA
Amboni Estate
Siga Caves
TANGA
ZANZIBAR
DAR ES SALAAM
Ujiji
BELGIAN
CONGO
TANGANYIKA
TERRITORY
LAKE TANGANYIKA
Mbanja
Lindi
Mikindani
Lake Rutamba
Rondo Plateau
Nchingidi
Kitaya
Ruvuma River
NORTHERN RHODESIA
NYASALAND PROTECTORATE
LAKE NYASA
MOZAMBIQUE
Scale in Miles
0 100 200

PLATE **2**

PLATE 2

FIG. 1. EMIN'S WORM SNAKE (*Leptotyphlops emini emini*)

During his retreat with H. M. Stanley from the southern Sudan, Emin Pasha discovered an example of this diminutive species. The uniformly silvery-black *emini* ranges from the Belgian Congo to the East Coast, but is replaced on Pemba Island by a form (*pembae*: 1941) which consistently differs in coloration and proportions.

FIG. 2. LESTRADE'S BLIND SNAKE (*Typhlops blanfordii lestradei*)

This beautifully glossy species varies considerably in coloration, rich coppery brown or black examples are those most frequently encountered. Many were found beneath lava boulders on the lava-strewn plains near Mount Mikeno, others in termitaria upon whose owners, as well as ants, they were found to be feeding. On Idjwi Island a Lestrade's blind snake was found in the stomach of another rare species — *Miodon gabonensis graueri*.

FIG. 3. AFRICAN KEELED GREEN SNAKE (*Hapsidophrys lineata*)

The figured female, a rich velvety green, its color accentuated by ten longitudinal black lines, was captured while moving slowly along a branch in deep forest. It was only five feet from the ground and as I took it by the neck made no attempt to bite, nor later when subjected to considerable provocation during a quarter-of-an-hour's posing for its photograph.

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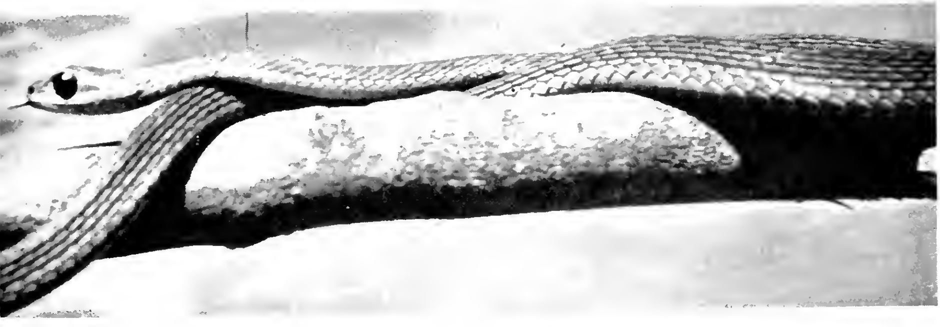

3

PLATE 3

PLATE 3

Fig. 1. White-lipped Snake (*Crotaphopeltis hotamboeia hotamboeia*).

This opisthoglyphous colubrine was encountered in the roadway at Ujiji; it immediately assumed the threatening attitude depicted and, flattening its head, struck savagely at anything approaching. So effective is the display that one instinctively accords such a snake the deference due to a more dangerous species.

Fig. 2. Gaboon Viper (*Bitis gabonica*) from Budongo Forest, Uganda.

At the same time one of the most beautiful, deadly, and sluggish of African snakes, this fifty-one inch reptile was found concealed in a patch of grass in the middle of a path from which it was removed to camp to be photographed. Her weight, eight pounds, was less than that of smaller examples though her stomach held two rats and many parasites of several species.

Fig. 3. Sedge Viper (*Atheris nitschei nitschei*) from Uganda.

The female shown, was one of a pair which I captured as they were basking in the late afternoon sun in a swamp at the base of the Ruwenzori Mountains. Both reptiles were at a height of six feet from the ground as they lay, tightly coiled but flat as plates, on top of dense tangles of creepers which smothered the elephant grass growing along the banks of a little stream meandering through a swamp at Mihunga, type locality of the synonym *A. woosnami*.

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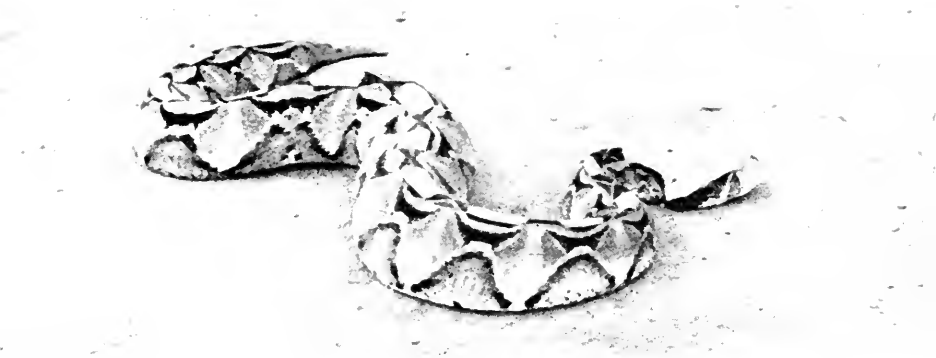

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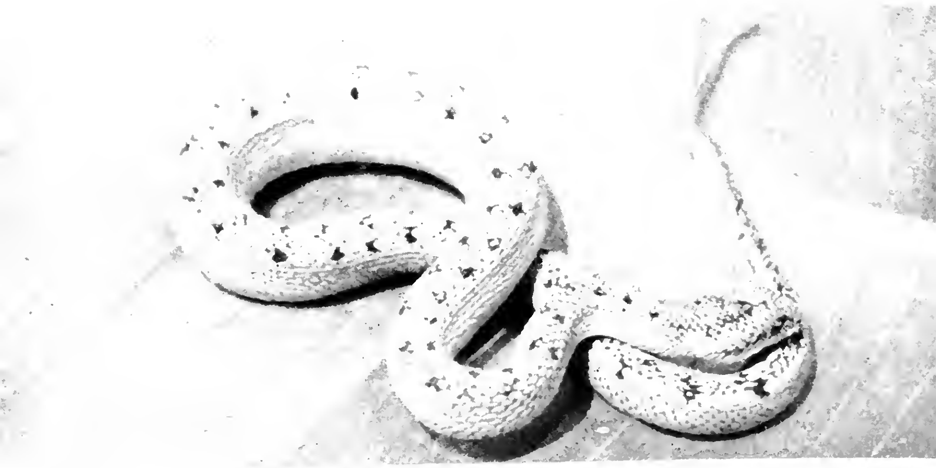

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PLATE 4

PLATE 4

Fig. 1. Hemptinne's Skink (*Scelotes tetradactylus hemptinnei*).

The series of these skinks found in slightly damp sandy soil beneath piles of dry or rotting vegetation in the gardens adjacent to the rice fields of Ruanda, from four to six miles east of Ujiji on the eastern shore of Lake Tanganyika, constitute the first record of the occurrence of this western race in the Territory.

Fig. 2. Spotted-lip Skink (*Mabuya maculilabris maculilabris*).

An examination of stomachs of this handsome species, revealed real wasps as well as a parasitic wasp, ants, plant bugs, a weevil and other beetles, moths, grasshoppers, a cockroach, fly and large spider. The figured specimen was captured on Idjwi Island, Lake Kivu, and is therefore topotypic of the alleged variety *kwidjwiensis*.

Fig. 3. Black-and-Gray Skink (*Lygosoma meleagris*) Mt. Ruwenzori.

On visiting the type locality of this little species, we found it plentiful though laborious to collect on account of its secretive habits. Many eggs, in various stages of development, were found, one pair was uncovered from which a skink had just hatched and even as we watched its fellow emerged. To escape from the egg the little creature makes a cut two-thirds the length of one side and involving the end of the parchment-like shell.

1

2

3

PLATE 5

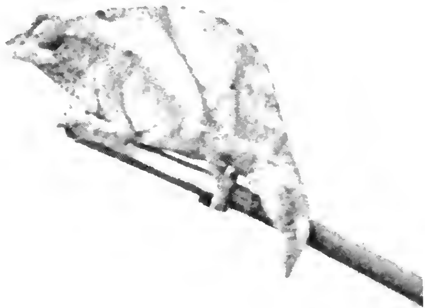
PLATE 5

Fig. 1. Pigmy Chameleon (*Brookesia spectrum boulengeri*).

Two-and-a-half inches in length, and lacking the prehensile tail of the typical genus, these small creatures never assume the bright colors of the larger forms, but are restricted to the shades usually associated with the dead leaves which they so closely resemble. The photograph is of a male on Idjwi Island.

Fig. 2. Kivu Chameleon (*Chamaeleo dilepis idjwiensis*).

The orange-spotted, green female figured above, is more handsome than her black-spotted mate. In protest at being photographed she bit a forefinger and hung on persistently, despite her size of over ten inches, however, the teeth failed to break the skin. A stomach held six green caterpillars and a Mylabris beetle so that these chameleons perform a useful service in the coffee plantations which they frequent.



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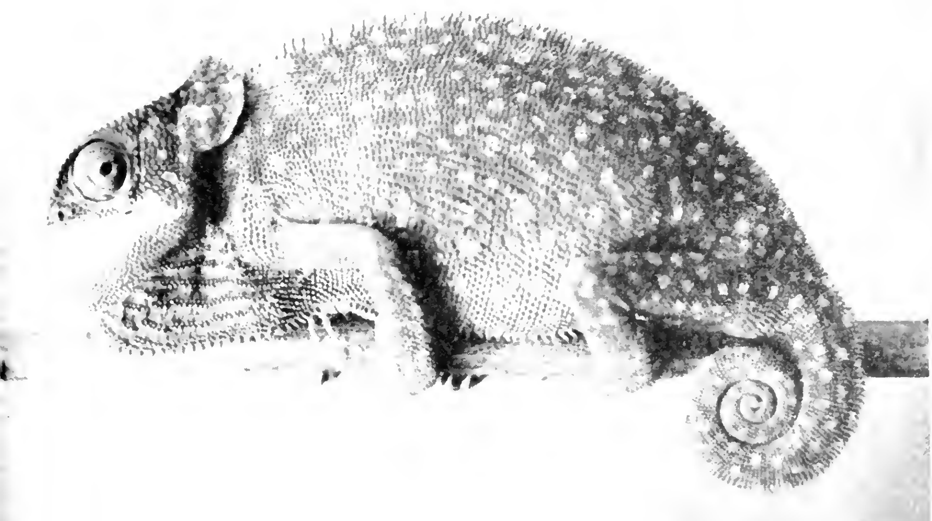

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PLATE 6

PLATE 6

Fig. 1. Johnston's Chameleon (*Chamaeleo johnstoni johnstoni*).

Topotypes of this moss-green and burnt-orange species were taken on the Ruwenzori Mountains where snails form an item in their diet. The males alone bear horns, a character which distinguishes the typical form from the eastern Congo race — *ituriensis* — in which both sexes are hornless.

Fig. 2. One-horned Chameleon (*Chamaeleo xenorhinus*) of Uganda.

Among the choicest acquisitions resulting from the expedition were a topotypic pair of this rare species, being difficult to obtain on account of its habitat in the forest canopy. With this species again it is the male alone that is horned, though, as may be seen from the photograph, the female displays an indication of one on the tip of the snout.

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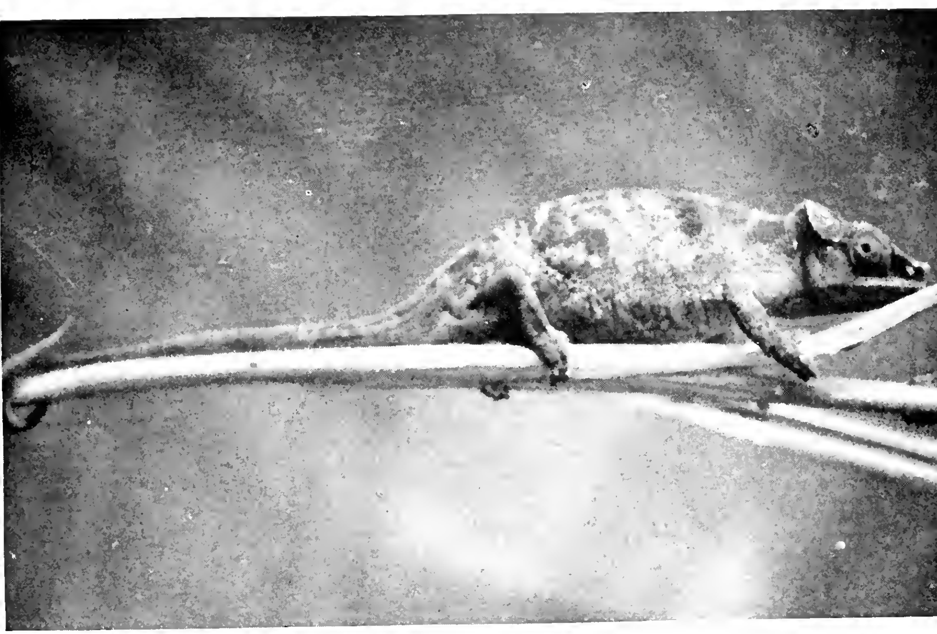

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Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE
Vol. XCI, No. 5

SCIENTIFIC RESULTS OF A FOURTH EXPEDITION TO FORESTED AREAS IN EAST & CENTRAL AFRICA

V

AMPHIBIANS

By Arthur Loveridge

With Four Plates

CAMBRIDGE, MASS., U.S.A.
PRINTED FOR THE MUSEUM
December, 1942

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE

The Bulletin and Memoirs are devoted to the publication of investigations by the Staff of the Museum or of reports by specialists upon the Museum collections or explorations.

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Bulletin of the Museum of Comparative Zoölogy

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PRINTED FOR THE MUSEUM

December, 1942

No. 5. — *Scientific Results of a Fourth Expedition to Forested Areas in East and Central Africa*

V

Amphibians

BY ARTHUR LOVERIDGE

CONTENTS

INTRODUCTION

The collection on which the following report is based, was made by the author while investigating the fauna of certain forested regions of East and Central Africa. The enquiry was carried out on behalf of the Museum of Comparative Zoölogy with a fellowship granted by the John Simon Guggenheim Memorial Foundation of New York.

A synopsis of the itinerary is given in the caption accompanying Plate 1—a map showing the principal position of the collecting localities. Altitudes and detailed information regarding the various camps will be furnished in the final report of this series which will deal with the general conclusions arrived at.

The period of collecting amphibians was from October 27, 1938, to July 25, 1939, during which time 1,681 amphibians, representing 77 forms, were secured. Ten of these were new to the Museum of Comparative Zoölogy, exclusive of certain others not previously recognized, but now considered valid as a result of this study of additional material.

Three forms are here described as new, one (in parenthesis) is based on material taken during an earlier expedition. The new forms are:

Bufo micranotis rondoensis	Nchingidi, Rondo Plateau, T.T.
Hyperolius parkeri rovumae	Kitaya, Rovuma River, T.T.
(*Arthroleptis xenodactyloides nkukae*)	Nkuka Forest, Rungwe Mtn., T.T.

In addition to these new forms, the undermentioned races or species are recorded for the first time for certain countries.

New for Uganda

Bufo funereus Bocage
Chiromantis rufescens (Günther)
Hyperolius alticola Ahl
Rana fuscigula angolensis Bocage
Rana christyi Boulenger
Phrynobatrachus plicatus (Günther)
Phrynobatrachus versicolor Ahl

Four of these, taken in the Budongo Forest, were already known from the Ituri Forest of the eastern Belgian Congo.

New for Tanganyika Territory

Leptopelis concolor Ahl
Hyperolius kivuensis Ahl
Rana mascareniensis venusta Werner

New for Belgian Congo

Xenopus laevis bunyoniensis Loveridge
Arthroleptis xenochirus Boulenger

New for Belgian Ruanda

Rana mascareniensis venusta Werner

Several species, most of which may be regarded as rareties, might be singled out for special mention, among them: *Leptopelis n. christyi*, *Megalixalus uluguruensis*, *Hyperolius schubotzi*, *H. flavomaculatus*, *Arthroleptis xenochirus*, *Spelaeophryne methneri*, and *Hoplophryne rogersi*.

ACKNOWLEDGEMENTS

The opportunity is taken of thanking Dr. Thomas Barbour, Director of the Museum of Comparative Zoölogy, for the support and encouragement which he has given to the prosecution of this undertaking,

and to the John Simon Guggenheim Memorial Foundation without whose generous aid this expedition would not have been possible.

In appreciation of the action of His Excellency the Governor of the Congo Belge in granting permission to collect on Idjwi Island, a selection of duplicates of such species as were collected in Belgian territory are being set aside for dispatch to the Congo Museum, Tervueren, after the German evacuation of Belgium.

The photographs illustrating this report were taken by my son, Brian A. Loveridge, and for permission to use the blocks for plate 4 we are indebted to the Editor of the Scientific Monthly, in which journal (June and July, 1940) they appeared as illustrations to a popular account of the safari.

The colored plates 2 and 3 showing age and sex dichromatism in the RHACOPHORIDAE are furnished through the generosity of Dr. Barbour. They represent the skillful work of Mr. Eugene N. Fischer, being based on color notes made in the field.

SUMMARY OF TAXONOMIC ALTERATIONS

The following forms are accorded subspecific rank:

Hylambates christyi Boulenger as *Leptopelis notatus christyi* (Boulenger).
Rappia sansibarica Pfeffer as *Hyperolius citrinus sansibaricus* (Pfeffer).

Topotypes of numerous doubtful species were collected and result in my considering the following as synonyms:

**Bufo r. kisoloensis* Loveridge	=	**B. regularis regularis* Reuss
Leptopelis budduensis Ahl	=	*?*Leptopelis n. christyi* Boulenger
**Hyperolius macrodactylus* Ahl	=	*Hyperolius schubotzi* Ahl
Hyperolius ornatus Laurent	=	*Hyperolius schubotzi* Ahl
**Hyperolius kwidjwiensis* Ahl	=	**Hyperolius kivuensis* Ahl
**Hyperolius kandti* Ahl	=	**Hyperolius kivuensis* Ahl
**Hyperolius koehli* Ahl	=	**Hyperolius kivuensis* Ahl
**Hyperolius substriatus* Ahl	=	**Hyperolius puncticulatus* (Pfeffer)
**Hyperolius microps* Günther	=	**Hyperolius pusillus* (Cope)
**Hyperolius milnei* Loveridge	=	**Hyperolius pusillus* (Cope)
Arthroleptis schubotzi Nieden	=	**Arthroleptis xenodactylus* Boulenger
**Arthroleptis affinis* Ahl	=	*Arthroleptis adolfifriederici* Nieden
**Arthroleptis schoenebecki* Ahl	=	*Arthroleptis adolfifriederici* Nieden
**Arthroleptis vagus* Ahl	=	**Arthroleptis s. lonnbergi* Nieden
**Arthroleptis ukamiensis* Ahl	=	**Arthroleptis s. lonnbergi* Nieden

*Topotypes or paratypes compared.

LIST OF SPECIES COLLECTED

CAECILIIDAE

BOULENGERULA BOULENGERI Tornier

Boulengerula boulengeri Tornier, 1896, Kriechthiere Deutsch-Ost-Afrikas, p. 164: Usambara Mountains, Tanganyika Territory.

10 (M. C. Z. 25001–9) Magrotto Mtn., T. T. 29. vi–10. vii. 39.

Distribution. These constitute the first record of its occurrence on this mountain which, however, is only twenty miles from the type locality. *S. vittatus* has already been recorded from Magrotto by Nieden (1912b).

Native name. Mango (Kisambara for caecilians).

Variation. Annuli 129–133, i.e. well within the range.

Size. Total lengths 112–250 mm.

Enemies. The largest specimen was recovered from the stomach of an elapine snake (*Elapsoidea güntherii*).

Habitat. Two juveniles were taken beneath logs; a 230 mm. adult in soggy wood of a rotten stump near clump of bamboos growing by stream.

Scolecomorphus vittatus (Boulenger)

Bdellophis vittatus Boulenger, 1895, Proc. Zool. Soc. London, p. 412, pl. xxiv, fig. 4: Usambara Mountains, Tanganyika Territory.

4 (M. C. Z. 25010–3) Magrotto Mtn., T. T. 1–10. vii. 39.

Native name. As last.

Variation. Annuli 132–149.

Size. Total lengths 132–145 mm.; diameter into length 29.5 to 36.6 times.

PIPIDAE

Xenopus laevis victorianus Ahl

Xenopus victorianus Ahl, 1924, Zool. Anz., **60**, p. 370: Busisi, Lake Victoria, Tanganyika Territory.

5 (M. C. Z. 25014–7) Mabira Forest, U. 8. xi. 38.
50 (M. C. Z. 25018–27) Fort Portal, U. 12. xii. 38.

Native name. Kikere (Luganda).

Color. All are typical in having the bellies heavily spotted, those from Fort Portal against a background of rich yellow.

Size. Lengths from 43–64 mm.

Habitat. The Mabira frogs were taken from a cement tank at the Mubango coffee factory, the Toro series were brought in by two men.

Xenopus laevis bunyoniensis Loveridge

Xenopus laevis bunyoniensis Loveridge, 1932, Proc. Biol. Soc. Washington, **45**, p. 114: Bufundi, Lake Bunyonyi, Uganda.

1 (M. C. Z. 25029) Nyakabande, U. 28. i. 39.
81 (M. C. Z. 25030–9) Mushongero, U. 1. ii. 39.
2 (M. C. Z. 25040–1) Mamvu, B. C. 22. ii. 39.

Native names. Magulumberi (Lukiga); *derima* (Lulega).

Color. Bright yellow below, at least posteriorly, only one light yellow one noted in the entire Mushongero series. My earlier assertion, based on an even larger series, that the belly is usually spotted, does not hold for the Mushongero series in which it is unspotted in 43 (lengths 25–48 mm.), and spotted only in 38 (lengths 28–68 mm.).

Size. This dwarf form from the cold waters of the Central African Highlands, commonly breeding at 35 mm., furnished six examples over 45 mm. of which the giant 68 mm. was a female, thus actually ex-

ceeding *victorianus!* These half-dozen larger frogs, however, possess the slender habitus of *bunyoniensis*, their greatest body width being but slightly broader than the head.

Enemies. The feet of one frog were recovered from the stomach of an otter (*Lutra m. tenuis*).

Habitat. These little frogs were extremely abundant in the waters of Lake Mutanda, on whose shore Mushongero is situated. At times we would see individuals which were unable to submerge, swimming desperately on the surface with something of the appearance of half-drowned shrews. My boatmen said that they were ill so I captured one and found that it was inflated almost to the roundness of a ping-pong ball. As already pointed out by Parker, the majority are afflicted with helminths.

Xenopus muelleri (Peters)

Dactylethra Muelleri Peters, 1844, Ber. Akad. Wiss. Berlin, p. 37: Mozambique.

14 (M. C. Z. 25042–50) Ujiji, T. T. 11. iii. 39.

Color. Bellies uniform, or only slightly spotted.

Size. Lengths 37–61 mm.

BUFONIDAE

Bufo brauni Nieden

Bufo brauni Nieden, 1910, Sitz. Ges. naturf. Freunde Berlin, p. 450: Amani, Usambara Mountains, Tanganyika Territory.

2 (M. C. Z. 25051–2) Magrotto Mtn., T. T. 11. vii. 39.

Native name. *Jula* (Kisambara corruption of *chura* and applied to most toads and frogs).

Color. Above, rich reddish leaf-brown paling towards the periphery; from snout to anus a hair-like, yellow, vertebral line; an interorbital marking which is rich black finely edged with yellow; pairs of similar markings on the scapular, lumbar, and supra-anal regions, between these larger blotches there are several pairs of smaller spots; sides of face, and flanks, black, sharply demarcated from the dorsal coloring; limbs grayish or cream-colored, distinctly barred and spotted with black. Below, whitish, the limbs showing some black spotting; palms and soles black, but some of the tubercles white.

Bufo regularis regularis Reuss

Bufo regularis Reuss, 1834, Mus. Senckenberg., **1**, p. 80: Egypt.
Bufo regularis kisoloensis Loveridge, 1932, Occ. Papers Boston Soc. Nat. Hist., **8**, p. 52: Kisolo, Kigezi District, Uganda.

8 (M. C. Z. 25053–8) S. Kinangop Plateau, K. C. 29. x. 38.
1 (M. C. Z. 25059) Budongo Forest, U. 29. xi. 38.
7 (M. C. Z. 25060–1) Kibale Forest, U. 9. xii. 38.
1 (M. C. Z. 25062) Bundibugyo, U. 20. xii. 38.
2 (M. C. Z. 25063) Mubuku Valley, U. 31. xii. 38.
3 (M. C. Z. 25064) Mihunga Ridge, U. 9. i. 39.
1 (M. C. Z. 25065) Nyakabande, U. 28. i. 39.
16 (M. C. Z. 25066–9) Mushongero, U. 1. ii. 39.
9 (M. C. Z. 25070–1) Kisenyi, B. R. 9. ii. 39.
2 (M. C. Z. 25072) Idjwi Id., B. C. 17. ii. 39.
1 (M. C. Z. 25073) Ujiji, T. T. 11. iii. 39.
1 (M. C. Z. 25074) Kitaya, T. T. 30. iii. 39.
1 (M. C. Z. 25075) Mikindani, T. T. 14. iv. 39.
2 (M. C. Z. 25076–7) Lindi, T. T. 1. vi. 39.

Native names. *Kikere* (Luganda; Lutoro; Lukonjo; Lulega); *mtuvu* ♂ and *ichcheri* ♀ (Lukiga); *kuvifata* (Luruanda); *ligumi* (Kiyao); *liumi* (Kimakonde; Kimawiha).

Variation. It is with some misgivings that I refer all these toads to the typical form: those from the Kinangop Plateau at 10,000 feet certainly appeared very different in life from those taken at the coast at altitudes of about 50 feet.

The numerous spinose warts on the interorbital space of the former may, and probably are, only conspicuous during the breeding season, which had just begun; nevertheless, breeding toads from elsewhere exhibit noticeably smoother crowns.

One might reasonably have supposed, as I did in 1932 when describing *kisoloensis*, that toads from the wet highlands (*circa* 6000–8000 feet) of the Kigezi District in the vicinity of the Kivu Volcanoes, would differ from typical Egyptian specimens, but though the type series from Kisolo (or Kisoro) exhibited a greater degree of webbing on their hind feet, the series now obtained from Nyakabande and Mushongero (about six and twenty miles from Kisolo respectively) do not differ sufficiently to justify the retention of this race.

Color. In life. The following notes were made in the field. Kinangop. Above, adults (3 ♂♂, 3 ♀♀) bright green, their dorsal spots exceptionally elongate, thus presenting a different appearance from those seen at lower altitudes. The youngest differed from the adults only in possessing unusually rufous parotids.

Kibale Forest. Above, backs flecked with cream color, giving them an unfamilar appearance.

Mushongero. Above, much cream color; a creamy white interorbital band and a pair of interorbital markings which are velvety black finely edged with cream; pairs of similar markings on the scapular and lumbar regions; a fine, cream, vertebral line and a creamy patch in centre of dorsum; a broad, cream, dorso-lateral band; from parotids to groin a black lateral band; limbs barred with black. Below, dirty white covered with a blackish network which laterally spreads up on to flanks; soles grayish black.

Kisenyi. Here the ♂♂ are bright yellow-ochre or yellowish green, but one, with a more rounded snout, has the markings of a ♀.

Lindi. The larger of two very young toads exhibits red on groin and on back of thighs, the younger on back of thighs only.

Size. Length of largest ♂♂, 87 (Kisenyi), 75 (Mushongero), 71 (Ujiji), 67 (Mubuku), 65 (Kinangop), 59 (Kibale); length of largest ♀♀, all of which, with the exception of Mihunga, *are gravid*, 100 (Budongo), 100 (Bundibugyo), 95 (Kisenyi), 90 (Mushongero), 80 (Kinangop), 80 (Nyakabande), 73 (Mihunga), 65 (Kibale), 60 (Kitaya). Measurements are in millimetres.

Breeding. As indicated above, females were gravid in most localities on the dates shown. Our arrival at Kinangop synchronized with that of the rains so that amphibians were assembling in every pool, the three males captured were all attempting to clasp the largest female with the result that they kept rolling over and over in the water to the accompaniment of curious little noises. Apparently assembling at Kisenyi, for males predominated in the proportion of 3 to 1 of those brought in by natives. Calling at Kitaya.

Parasites. Acarine parasites on Kinangop toads. See *Arthroleptis minutus* also.

Enemies. Two young recovered from the stomach of a green snake (*Chlorophis irregularis*) on Idjwi, one from a white-lipped snake (*Crotaphopeltis h. hotamboeia*) at Ujiji.

Bufo funereus Bocage

Bufo funereus Bocage, 1866, Jorn. Sci. Lisboa, **1**, p. 77: Duque de Bragança, Angola.

2 (M. C. Z. 25078–9) Mabira Forest, U. 9. xi. 38.
2 (M. C. Z. 25080–1) Budongo Forest, U. 30. xi. 38.
2 (M. C. Z. 25082–3) Kibale Forest, U. 9. xii. 38.

Distribution. Though widespread, and frequently recorded from Angola and the Congo, this species is new for Uganda, doubtless having been confused at times with *r. regularis* alongside which it occurs in at least two of the foregoing localities, and which it so closely resembles.

Variation. Differs from *B. r. regularis* in the complete absence of a tarsal fold, and the usually more extensive webbing of the toes.

Size. Length of only ♂, 57 mm., of ♀♀, 60–66 mm.

Breeding. Apparently about to spawn in all three localities.

Bufo lönnbergi nairobiensis Loveridge

Bufo lönnbergi nairobiensis Loveridge, 1932, Occ. Papers Boston Soc. Nat. Hist., **8**, p. 48: Nairobi, Kenya Colony.

16 (M. C. Z. 25084–9) S. Kinangop Plateau, K. C. 29. x. 38.

Variation. Entire series measured with following results. Third finger included 7.2–8.7 times in the length from snout to anus; fourth toe 4.6–5.5 times; tibia 2.5–3 times. Thus they are quite clearly referable to this form rather than to the typical one from Mt. Kenya as defined in my key on p. 50 of the above citation.

Size. Lengths of 13 ♂♂, 28–38 mm., of 3 ♀♀, 33–39 mm.

Breeding. The males were calling from large pools formed in cart tracks crossing the plateau at 10,000 feet. In such pools as had grassy bottoms these little toads might be seen walking about on the grass as if on land.

Bufo micranotis rondoensis subspec. nov.

11 (M. C. Z. 25090–100) Nchingidi, T. T. 11–19. v. 39.

Type. Museum of Comparative Zoölogy, No. 25090, a non-breeding adult from Nchingidi, 3000 feet, Rondo Plateau, Lindi Province, southeastern Tanganyika Territory. Collected by Arthur Loveridge, May 11–19, 1939.

Paratypes. Museum of Comparative Zoölogy, Nos. 35091–35100, being 10 specimens with same data as type.

Diagnosis. Differs from *micranotis* Loveridge (1925, Proc. Zool. Soc. London, p. 770, pl. i, fig. 1) of Kilosa and the Uluguru Mountains, only in the throat being almost entirely white in the entire series, whereas in both sexes of *micranotis* (taken in amplexus) the throat is so heavily overlaid with black as to appear black.

Color. In life. Above, brown marbled with black; from nape to anus a hair-like, light, vertebral line (absent in some paratypes); warts slightly rufous encircled with black; sides of head white, streaked and spotted with black. Below, throat white very sparsely spotted or vermiculated with brown; chest, belly, and limbs faintly bluish white heavily overlaid with black.

The color often harmonized remarkably with the sandy soil on which this tiny species is found.

Size. Length of type from snout to anus, 19 mm., of paratypes 19 (2 ex.), 18 (2 ex.), 17 (2 ex.), 14 (2 ex.), 12 (2 ex.) mm.

Remarks. In view of the fact that none of the above attain to the size of typical *micranotis* (♂♂ 20–22 mm., ♀ 23 mm.), the possibility of the white throats being a subadult character should not be overlooked. Nchingidi is about 300 miles southeast of Kilosa, type locality of *micranotis.*

Diet. Stomachs held: chrysomelid larva; phalacrid beetle; fly (Cecidomyiidae); springtail *(Collembola);* a true bug; five termite workers; two land snails whose shells had been dissolved away.

Habitat. Following a night and morning of very heavy rain, the first of these toads was seen at 11 a.m. as it sought shelter under the awning of my tent which was pitched on sandy ground in a clearing on the outskirts of the forest. The rest were taken beneath logs lying at the forest-edge.

NECTOPHRYNOIDES TORNIERI (Roux)

Nectophryne tornieri Roux, 1906, Proc. Zool. Soc. London, **1**, p. 63, pl. ii, fig. 4: Ukami, Tanganyika Territory.

68 (M. C. Z. 25101–5) Magrotto Mtn., T. T. 1–6. vii. 39.

Color. In life. Adults. Above, ranging from pale gray through shades of olive and dusky brown to reddish brown with, or without, mottlings, scarcely two alike; bright yellow spots—one in front of each eye and three on either flank—present only in one female, which was gravid with tadpoles; a light vertebral line present on seven specimens only. Young. For the most part, very young toads presented a rather *Arthroleptis*-like appearance, being pale gray with dark sepia marblings.

Size. Lengths from 10–34 mm., the largest a gravid female.

Breeding. Most females from 26–34 mm. long, were gravid with eggs, a few with tadpoles.

Habitat. Apparently rare in the deforested area now occupied by the oil-palm plantation, though I took one on an oil palm at a height

of four feet and another on the floor of an adjacent patch of forest. Hearing that the sole surviving stand of wild bananas on the mountain were to be found on some rocky heights at Kitulwe, we made two journeys to the spot and there obtained 56 frogs of which about half were young.

RHACOPHORIDAE

Chiromantis ? rufescens (Günther)

Polypedates rufescens Günther, 1868, Proc. Zool. Soc. London, p. 486: West Africa.

2 Nests (M. C. Z. 25106) Budongo Forest, U. 5. xii. 38.

Distribution. The only record of the occurrence of a *Chiromantis* in Uganda known to me, is the inclusion of *C. xerampelina* in Boulenger's (1902a) list in Johnston's "Uganda Protectorate." As however, *C. xerampelina* in East Africa is chiefly a species of the coastal belt, though penetrating into the interior further south, it seems more probable that the species occurring in northwest Uganda is *rufescens;* unfortunately no frogs were collected.

Breeding. The eggs when fresh, were pale greenish, but turned bright orange on being dried, possible through exposure to formalin fumes. According to the native collector, the shrub, to whose leaves the nests are attached, was overhanging a stagnant stream at the forest edge.

Chiromantis xerampelina Peters

Chiromantis xerampelina Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 627: Tete and Sena, Mozambique.

Nest & 8 (M. C. Z. 25107–9) Kitaya, T. T. 25–31. iii. 39.
2 (M. C. Z. 25110–1) Mikindani, T. T. 12. iv. 39.

Native names. *Chitowa* (Kiyao); *kitowa* (Kimakonde), but applied to *Megalixalus, Hyperolius,* and *Rana edulis* as well.

Color. In life. ♀. Hind legs and groin of breeding frog tinged with yellow.

Size. Lengths of ♂♂ 48–50 mm., of ♀♀ 67–72 (M. C Z. 25110).

Breeding. On March 25, nests, which appeared to be about two weeks old, were found on a fence in a rice swamp. On the 30th a freshly deposited nest was found in grass, no higher objects being in

the vicinity, six inches above the surface of a recently-formed pool, a female frog was found resting on the bank within a yard of the nest.

Habitat. Two other females and three males were taken one night as they rested on grass stems projecting from a pool and palm fronds overhanging it. The Mikindani females were taken at a height of nine feet while resting in a bush and tree respectively.

Leptopelis concolor Ahl

Plate 2, figs. 5–6.

Leptopelis concolor Ahl, 1929, Sitz. Ges. naturf. Freunde Berlin, p. 192: Witu, Kenya Colony.

2 juv. (M. C. Z. 25112, 25300) Mikindani, T. T. 12. iv. 39.
1 juv. (M. C. Z. 25113) Siga Caves, T. T. 14. vi. 39.
1 hgr. (M. C. Z. 25114) Tanga town, T. T. 22. vii. 39.

Distribution. The above constitute the first records of the occurrence of this species in Tanganyika Territory.

Variation. The subadult frog has been compared with a series of topotypes from Witu. Identification of the juveniles, however, should be accepted with reserve as the characters are not too well defined in such very young frogs. The one from Siga Caves, near Tanga, appears to have a slightly longer hind limb, a condition possibly resulting from its subjection to the action of gastric juices and consequently slightly macerated state.

Color. This Siga froglet should possibly be referred to *johnstoni* for its back is green spotted with yellow as is the case with the young of that species, its digital characters, however, seem to be those of *concolor*. The Mikindani froglets, which are 2–3 mm. smaller, have uniformly green backs. The Tanga frog had assumed the brown livery of the adult as depicted in the accompanying plate.

Size. Lengths (M. C. Z. 25300) 16 + 10 mm., (25112) 15 mm., (25113) 18 mm., (25114) 30 mm.

Breeding. On April 12, at Mikindani, one froglet with the stump of a tail, another of same length but with tail already absorbed.

Enemies. Three juveniles, two partly digested and so discarded, recovered from the stomach of a spotted wood snake (*Philothamnus s. semivariegatus*) near Siga Caves.

Habitat. At Mikindani taken in rice swamp and on sandy soil in camp; at Tanga beneath rubbish on the outskirts of the township.

Leptopelis johnstoni (Boulenger)

Plate 2, figs. 3–4.

Hylambates johnstoni Boulenger, 1897, Proc. Zool. Soc. London, p. 803, pl. xlvi, fig. 4: Kondowe; Karonga; and Nyika Plateau, Nyasaland.

13 (M. C. Z. 25125–35) Magrotto Mtn., T. T. 7. vii. 39.

Native name. *Nkewe* (Kisambara).

Variation. The series consists of a typically colored brown ♀, adult of 68 mm., and twelve frogs ranging from 18–48 mm. which I assume to be the young as they agree in all physical characters such as outer finger with one and a half joints free of web; outer toe with a narrow margin of web on the last joint; fourth toe with the last two joints free of web.

In coloration, however, they are amazingly different from the adult. In the field I thought they represented some distinct species but dissection of the 35 and 48 mm. frogs leads me to think that all are immature. See also remarks (Loveridge, 1936k, p. 387) on *johnstoni* from Ngatana.

Color. In life. 48 mm. Above, rich light green as if enameled, flecked with yellow; a conspicuous cream spot on each elbow, knee, and heel.

In life. 35 mm. As last, but lips, as well as spots white. In alcohol there is now no difference in the appearance of the lips of these two frogs, and the entire series, with two exceptions, exhibit a white line on the outer aspect of forearm and finger, and another on the outer aspect of foot and toe. No mention of such a mark was made in the field, however, yet they are too conspicuous to have escaped notice.

In life. Tailed froglet 18 + 25 mm. Above, as larger with back flecked with yellow, and white spots on elbow, knee, and heel, but no white on lips.

Size. Lengths 18–68 mm.

Breeding. On July 7, the largest female was distended with numerous white ova.

Diet. Orthoptera including some quite large grasshoppers.

Parasites. Large nematodes (*Amplicaecum involutum*) in intestines.

Habitat. I found the 48 mm. frog seated on my arm after I had brushed past some ferns projecting from the stem of an oil palm growing at the edge of the swamp—in which the tadpole was taken—immediately below my camp. The 35 mm. frog was in one of the fifty

wild bananas searched at Kitulwe. Most of the other young were taken one morning after heavy rain as they were squatting on broad-leaved plants in a little dell or clearing in the forest.

LEPTOPELIS NOTATUS CHRISTYI (Boulenger)

Plate 2, figs. 5–6. Plate 4, fig. 1.

Hylambates christyi Boulenger, 1912, Ann. Mag. Nat. Hist. (7), **12**, p. 556: Mabira Forest, Kyagwe, Uganda.

? *Leptopelis budduensis* Ahl, 1929, Sitz. Ges. naturf. Freunde Berlin, p. 199: Northwest Buddu Forest, Tanganyika Territory.

♀ (M. C. Z. 25114) Mabira Forest, U. 7. xi. 38.
6 yng. (M. C. Z. 25115–9) Kibale Forest, U. 12. xii. 38.
2 ♀ ♀, 2 yng. (M. C. Z. 25120–3) Mihunga Swamp, U. 18. i. 39.

Native name. Lulenga ya miti (Luganda + Kiswahili = frog of the tree).

Variation. The series consists of three gravid females (43–50 mm.)? and 8 young (18–26 mm.) which bear little resemblance to the adults! These young, however, agree closely with the brief description of the 23 mm. Cameroon frog called *notatus* by Buchholz and Peters, 1875, and later figured by Nieden. Subsequently two 33 mm. frogs from Zima, Cameroon, formed the basis of the description of *Hylambates cubitoalbus* Boulenger, 1906, which Parker considers synonymous with *notatus*, but the two additional frogs from Bunyoro, Uganda, mentioned by Boulenger, Parker refers to *christyi*, which may, or may not, be subspecifically distinct. Trinomials are employed to show this close relationship and avoid further confusion.

The 50 mm. topotypic ♀ agrees with the Ruwenzori ♀ ♀ in differing from Boulenger's description of the 53 mm. holotype ♀ in the vomerine teeth being directly between (not behind the level of the hinder edge) the choanae; the snout is longer than (not as long as) the orbital diameter; the inner metatarsal tubercle is relatively small (not large) in the Mabira frog, but is large in the two Mihunga ♀ ♀.

The young differ from the adults, not only in coloration as described below, in their less extensive webbing which might fairly be described as "a rudiment" for the fingers, while the fourth toe has two joints free of web, and the fifth only one joint free. In the adults, on the other hand, the outer finger has only 1 joint free of web; the fourth toe also has only one joint free though there is a narrow, or moderately broad,

margin of web on the penultimate joint; the fifth toe is fully, though somewhat narrowly, webbed.

Color. In life. Kibale Forest. Young 18–20 mm. Above, rich, light green as if enameled; a conspicuous white spot on each elbow, knee, and heel. Below, pure white.

In life. Mihunga Swamp. Young 23–26 mm. Both bearing permanent spots like the foregoing, but those of the smaller are yellow.

In life. Mihunga Swamp. Gravid ♀ 46 mm., taken within 100 feet of the last, had, on its elbows only, fugitive light spots that disappeared on preservation. Above, bright green grass, on end of snout a cream-colored vertical spot, two more on lip; a dark brown canthal streak from nostril through eye to a short distance behind tympanum; an interorbital bar and vertebral markings of genus in darker green more or less edged with brown; a dark brown circum-anal spot edged with cream and flanked on thighs by creamy flecks; flanks with brown and creamy vermiculations; fore and hind limbs with very indistinct transverse dark bars. Below, white, except for brown infuscations on throat and outer side of hind feet.

In life. Mihunga Swamp. Gravid ♀ 48 mm. Above, pale brown; a broad, black, canthal streak from end of snout through eye to above tympanum; dorsum devoid of markings; a dark circum-anal spot; flanks and groin irregularly flecked with brown, the lower flanks with a number of fine yellow spots; limbs and feet indistinctly barred with broad brown bands. Below, creamy white, except for brown infuscations on throat, breast and from elbow to wrist of fore limb, hind limb and underside of feet, while the belly is tinged with yellow from the spawn within.

In life. Mabira Forest. Gravid ♀ 50 mm. Above, pale brown with darker flecks indicating vertebral markings of genus; flanks spotted with brown; limbs and feet barred with broad brown bands; axilla and groin slightly bluish; Below, throat a faintly greenish, dirty white; breast and belly anteriorly sparsely spotted with brown, and belly stained with rust color; limbs obscurely yellow-buff, unspotted; soles slightly darker. Inside of mouth green, dilated pupil milky blue surrounded by golden-brown iris.

The differences in coloration are reflected by habitats as recorded below.

Size. See above.

Breeding. On November 7 and January 18 females were gravid, while on December 12 very young frogs were found, slightly larger ones on January 18.

Diet. Two stomachs held small grasshoppers in addition to indeterminate insect remains.

Habitat. The Kibale series were found on a shrub by a stream, a couple on a felled tree, others on a forest trail after a heavy downpour which had apparently dislodged them from the forest canopy. The three green Ruwenzori frogs were taken on rich green sedges within twenty feet of a stream, the brown one was clambering over felled sedges that had been cut earlier in the day. The brown Mabira female was beneath loose bark on the trunk of a tree at a height of only two feet from the ground, a second brown frog was seen calling at midday, as is their custom, from a yellow-brown shrub growing among straw-like dry grass in the garden.

Leptopelis vermiculatus (Boulenger)

Hylambates vermiculatus Boulenger, 1909, Ann. Mag. Nat. Hist. (8), **4**, p. 497: Amani, Usambara Mountains, Tanganyika Territory.

juv. (M. C. Z. 25136) Magrotto Mtn., T. T. 8. vii. 39.

Variation. This emergent frog possesses all the key characters except that the webbing on the hind feet is a little less full, it has been compared with a slightly larger topotype.

Color. In life. Tailed froglet. Above, pale, slightly yellowish, green finely vermiculated with black; a conspicuous white spot on each elbow, knee, and heel; limbs white, heavily crossbarred with black; elbow region of forearm and tibia of hind limb green and vermiculate like back; digital disks of fingers white, of toes dusky grayish. Below, whitish with dusky speckling on throat and sides of belly.

Size. Length 18 + 10 mm., the stump of tail being in process of absorption.

Habitat. Taken in swamp immediately below my camp.

Hylambates maculatus Duméril

Hylambates maculatus A. Duméril, 1853, Ann. Sci. Nat. (3), **19**, p. 165, pl. vii, figs. 1–1b and 4: Zanzibar.

1 ♂ 3 ♀ ♀ (M. C. Z. 25137–9) Kitaya, T. T. 28. iii. 39.
13 ♂ ♂ 1 ♀ (M. C. Z. 25140–9) Amboni, T. T. 17. vi. 39.

Native name. *Nanhengo* (Kimakonde, for *Kassina* also).

Size. Length of ♂ ♂ 63–68 mm., of ♀ ♀ 58–71 mm.

Breeding. Great numbers were calling in a pond close to Amboni Village, near Tanga, though the rains were nearly over in this dis-

trict. The cry is *quck-quck*, with an explosive pop in it, hence more resonant than that of *Rana m. mascareniensis*.

Habitat. At Kitaya beneath damp weeds recently uprooted and piled at the edge of a rice swamp, one on a grass stem a foot above the water. At Amboni the majority were immersed in the pond with only their heads showing.

Kassina senegalensis (Duméril & Bibron)

Plate 4, fig. 2.

Cystiganthus Senegalensis Duméril & Bibron, 1841, Erpet. Gén., **8**, p. 418: Galam, Senegal.

♀ (M. C. Z. 25150) Idjwi Id., B. C. 23. ii. 39.
juv. & ♂ (M. C. Z. 25151–2) Kitaya, T. T. 25. iii. 39.

Native name. *Kabunda* (Lulega); *nanhengo* (Kimakonde, for *Hylambates* also).

Remarks. The generic definition of *Kassina* appears badly in need of revision for not only do young *Kassina* often lack vomerine teeth but on occasion the adults also. It was the absence of such teeth that, in part, led Hoffman (1939) to describe *Semnodactylus thabanchuensis* from the Transvaal, and Laurent (1940) the genus *Kassinula wittei* from the extreme southern Belgian Congo, the latter based on juveniles of 12.5–14 mm. in length. That they are not the young of *senegalensis* seems clear from the fact that our tailed froglet listed above measures 23 mm. from snout to anus and all the smallest of our completely metamorphosed young are 20 mm. in length. Both *thabanchuensis* and *wittei* bear a striking resemblance to *wealii* with which they should be compared.

Size. Length of ♂ 45 mm., of ♀ 44 mm., of tailed froglet 23 + 10 mm.

Breeding. On February 23 the ♀ was gravid, and in that condition led to the description of *angeli* Witte.

Megalixalus fornasinii fornasinii (Bianconi)

Euchnemis Fornasinii Bianconi, 1848 (not 1850), Spec. Zoöl. Mosamb., Rept., pl. v, fig. 1: Mozambique.

3 ♂ 2 ♀ (M. C. Z. 25153–4) Kitaya, T. T. i. iv. 39.
3 ♀ (M. C. Z. 25155–6) Siga Caves, T. T. 9. vi. 39.
4 ♂ 4 ♀ (M. C. Z. 25157–8) Amboni Est., T. T. 17. vi. 39.
1 ♀ (M. C. Z. 25159) Magrotto Mtn., T. T. 1. vii. 39.

Native names. Chitowa (Kiyas); *kitowa* (Kimakonde), but applied to *Chiromantis* and *Hyperolius* also.

Remarks. Trinomials are employed on account of the recently described *M. f. gongicus* Laurent (1941) which, to judge by our four Congo specimens may be differentiated in pattern from *M. f. dorsalis* (Peters) of Cameroon. The differences are slight, however, and occasionally complicated by the occurrence of uniformly colored examples in both races. The typical form has physical distinctions.

Color. Uniform or with a vertebral streak, normally dark, but in M. C. Z. 25155 the normal arrangement is reversed and the streak is light, flanked by darker.

Size. Length of ♂♂ 31–37 mm., of ♀♀ 31–38 mm.

MEGALIXALUS LEPTOSOMUS (Peters)

Hyperolius leptosomus Peters, 1877, Monatsb. Akad. Wiss. Berlin, p. 619, pl. —, fig. 5: Chinchoxo, Portuguese Congo.

Remarks. In a recent paper on the *Megalixalus* of the Congo Belge, Laurent (1941c, p. 127) suggests that the Kabengere from which I (1936h, p. 103) recorded *leptosomus*, is not on the Luapula River, but lies farther north in the neighbourhood of Nyonga. In this he is undoubtedly correct for Mr. J. T. Zimmer, who collected the frogs in 1926, writes:

> "my locality Kabengere is not on the Luapula River but is in another part of the 'Haut Luapula' District, at least it was so called when I was there although I believe they call it now Haut Katanga. In this District my collections were all made at Bukama, Katobwe and Kabengere. At Kabengere we were on the edge of true forest and found some things that showed this ecological association, but in the main the area was exactly the same as that at Katobwe. We were only two days' walk southeast from Katobwe and it was two days' walk southwest from Kabengere to Bukama, so the exact locality is about 9° 15′ x 26° 15′. If you look up Reichenow's 'Vog. Afr. Atlas,' page 22, you will find a Katapäna which is our Kabengere. For some reason which I have forgotten Katapena is an alternative name for Kabengere; at least I have the alternative name in my journal without comment."

I quote Mr. Zimmer at length as he collected a great many species of frogs at both Kabengere and Katobwe, which are *not* on the Luapula River.

Dr. Laurent then breaks up *leptosomus* into three forms and suggests that the Kabengere frogs should probably be referred to one of his new forms, viz. *M. l. upembae* (p. 125). Of the original series of 19 frogs which I listed, 9 are now in the Museum of Comparative Zoölogy. Using the key (p. 132) furnished by Dr. Laurent, I should say that two of these might be referred with equal justification to either *l. leptosomus* or *l. upembae* as they combine the key characters; one (M. C. Z. 19176) has broad, the other (M. C. Z. 19177) narrow, dorsal lines; in the former the tibio-tarsal articulation reaches the shoulder, in the latter it fails to do so; in both the length of the tibia is about 2¼ times in the length from snout to anus, in which respect they do not appear to differ from our Cameroon and French Congo material, so I fail to see how *upembae* can be recognized.

In the remaining 7 specimens (M. C. Z. 19178–84) the dorsal bands unite in a point in the interocular region and are therefore referable to *M. wittei* Laurent (p. 127), an apparently valid species differing only from *leptosomus* in this marking and in averaging a trifle larger. In answer to my enquiries, Mr. K. P. Schmidt has kindly informed me that the rest of the series in the Field Museum is divided equally as between *leptosomus* and *wittei*.

MEGALIXALUS ULUGURUENSIS Barbour & Loveridge

Megalixalus uluguruensis Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 231, pl. iii, fig. 2: Vituri, Uluguru Mountains, Tanganyika Territory.

♀ (M. C. Z. 25160) Magrotto Mtn., T. T. 12. vii. 39.

Color. In life. ♀. Above, enamel white; from nostril through eye to halfway along flank a brownish band; back with a few irregularly scattered brown flecks; upper arms and thighs translucent; forearm, tibia, foot, and to a lesser extent the thigh also, with minute, black-centered, enamel-white spots (under high magnification these black centers are seen to be irregular, 5-pointed, black stars); hands and feet translucent yellow; disks of digits and toes almost orange. Below, chest pure white, remaining under surfaces transparent.

Size. Length 28 mm.

Breeding. On July 12, three large cream-colored eggs were (and still are) visible through the transparent abdominal skin.

Habitat. I captured this frog among leaves between the mighty buttress roots of a tree in a patch of forest remote from my camp. It

was taken at 10 a.m. immediately following several hours of very heavy rain and constitutes the first record of this very *Hyperolius*-like species on Magrotto Mountain. Recognizing it, I immediately checked its pupil which was plainly vertical.

MEGALIXALUS BRACHYCNEMIS Boulenger

Megalixalus brachycnemis Boulenger, 1896, Ann. Mag. Nat. Hist. (6), **18**, p. 403, pl. xvii, fig. 2: Chiradzulu, Nyasaland.

60 ♂ 17 ♀ (M. C. Z. 25161–2) Kitaya, T. T. 25–31. iii. 39.
4 ♂ (M. C. Z. 25163–4) Mikindani, T. T. 8. iv. 39.
1 ♂ 1 ♀ (M. C. Z. 25165–6) Siga Caves, T. T. 16. vi. 39.
36 ♂ 2 ♀ (M. C. Z. 25167–8) Amboni Est., T. T. 17. vi. 39.
2 ♂ 3 ♀ (M. C. Z. 25169–70) Magrotto Mtn., T. T. 1. vii. 39.

Variation. Of this species, which has on four occasions been decribed as a *Hyperolius* by Ahl, I noted at Kitaya: "Pupil definitely vertical," and on Magrotto: "After anaesthetization the pupil was indistinctly vertical in a young frog and almost round in an adult, the latter retaining only a slight v at base."

Color. In life. Kitaya. ♂. Above, dusky yellow minutely punctate with black; from nostril through eye to groin extends a broad, dusky, irregular, lateral band which is punctate with white; back with a dusky gray M-shaped marking. Below, sac chrome; breast and belly pure white; throat between sac and breast like all remaining underparts a semitransparent flesh color with the digits slightly yellow.

Thus below it is very similar to *Hyperolius c. citrinus* though above quite dissimilar.

In life. Kitaya. ♀. Above, substantially like the male but with the dorsal markings more frequently absent. Below, throat, breast, and belly uniformly pure white.

In life. Magrotto. Adult and young of 17 mm. Above, both were golden bronze with mottlings of greenish bronze on which were superimposed white specks or dots.

Size. Length of ♂♂ 18–23 mm., of ♀♀ 21–25 mm. A slight, but definite increase in size is noted as one proceeds southwards, viz. ♂♂ 20–21–19–22–23 mm., ♀♀ 22–21–22–25 mm. About March 31, the largest of six tailed froglets measured 11 + 14 mm.

Breeding. Our arrival at Kitaya almost synchronized with the breaking of the big rains. On March 25 males were calling from a rice swamp at the edge of the Rovuma River and one clasping pair were taken on

a horizontal blade of rice. On each of four succeeding days the number of males taken decreased, the number of females increased. On June 17, though the rains were almost over, a few males might still be heard calling at Amboni in a swamp near the village. Females, of course, were gravid when taken.

Enemies. One recovered from the stomach of a spotted wood snake (*Philothamnus s. semivariegatus*).

Habitat. The great majority, having assembled, were taken in recently-formed rice and sedge swamps, but a couple were taken beneath rubbish a good way from water on March 29. A search of fifty wild bananas at Kitulwe, on Magrotto, resulted in the capture of two whose unusual coloring, noted above, may be attributed to habitat.

Hyperolius schubotzi Ahl

Hyperolius schubotzi Ahl, 1931, Das Tierreich, no. 55, p. 329, fig. 202: Kissenji, *i.e.* Kisenyi, Lake Kivu, Belgian Ruanda-Urundi. (♀. 33 mm. Schubotz coll.).

Hyperolius macrodactylus Ahl, 1931, Das Tierreich, no. 55, p. 368: Lake Kivu, Belgian Congo. (♀. 37 mm. Kandt coll.).

Hyperolius ornatus Laurent, 1940, Revue Zool. Bot. Africaine, **34**, p. 4, pl. ix, figs. A. C. D.: Ruchuru, Belgian Congo. (Type 32 mm.).

11 ♂ 28 ♀ (M. C. Z. 25174–89) Mamvu Bay, B. C. 15. ii & 6. iii. 39.

Native names. *Kashembero* (Lulega); *neosa* was also used on Idjwi.

Synonymy. I personally captured the entire series listed above in a small patch of sedges growing in Mamvu Bay, Idjwi Island (where Kandt lived), Lake Kivu, and concluded that the two types—the finely vermiculate ♀ *schubotzi* and largely marmorate ♀ *ornatus* were one species for they appear to grade from one to the other. In size there was no difference for the *schubotzi* ranged from 37–41 mm. and the *ornatus* type from 36–41 mm. By its dimensions and pattern I judge that *macrodactylus* is yet another synonym. One of Ahl's paratypes of *variabilis*, that from Idjwi Island, should doubtless be included though the Bukoba cotypes of *variabilis*, sent me by Ahl, appear to represent a smaller species.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free, outer toe webbed to disk; tibio-tarsal articulation reaches eye rather fully in all but one frog where it just falls short.

Color. In life. ♀. Above, black with well separated wavy yellow lines and a few spots; around anus silvery with black vermiculations; thighs whitish with blood red vermiculations; tibia and foot like back.

Below, throat silvery blotched with black; chest and belly immaculate white; lower side of thighs with red vermiculations. (This is the *ornatus* phase).

♀. Similar to the last except that it is the ground color which is yellowish green with very numerous black vermiculations. (This is the *schubotzi* phase).

Twelve females (M. C. Z. 25174–7), 37–41 mm., are light, finely vermiculate with darker as figured for *schubotzi*, which species they undoubtedly represent. Fourteen females (M. C. Z. 25178–82), 36–41 mm., are so heavily overlaid as to appear black with lighter, and very varied, vermiculations (*ornatus*) some even forming longitudinal lines (*macrodactylus*). Two apparently young females (M. C. Z. 25183–4), 34 mm., resemble the males.

The eleven males (M. C. Z. 25185–9), 35–39 mm., now an almost uniform putty color, were, as I recollect, yellowish in life; one or two show faint traces of a dark canthal and/or postocular band.

Size. Length of ♂♂ 35–39 mm., average 36.3 mm.; of ♀♀ 34–41 mm., average 34.6 mm.

Breeding. On February 15, four males were taken when calling.

Enemies. Three in the stomach of a green snake (*Chlorophis irregularis*) up the mountain.

Habitat. On reeds and sedges in knee-deep water in Mamvu Bay.

Hyperolius kivuensis Ahl

Hyperolius kivuensis Ahl, 1931, Das Tierreich, no. 55, p. 280, fig. 151: Lake Kivu, Belgian Congo. (♀. 34 mm. Kandt coll.).

Hyperolius kwidjwiensis Ahl, 1931, Das Tierreich, no. 55, p. 296, fig. 172: Idjwi Island, Lake Kivu, Belgian Congo. (♂. 32 mm. Schubotz coll.).

Hyperolius kandti Ahl, 1931, Das Tierreich, no. 55, p. 327: Lake Kivu, Belgian Congo. (♂. 33 mm. Kandt coll.).

Hyperolius koehli Ahl, 1931, Das Tierreich, no. 55, p. 405: Kisenyi, Lake Kivu, Belgian Ruanda-Urundi. (♂. 33 mm. Koehl coll.).

1 ♂ 1 ♀ (M. C. Z. 25190–1) Mamvu Bay, Idjwi Id., B. C. 6. iii. 39.
2 ♂ 1 ♀ (M. C. Z. 25192–4) Ujiji, L. Tanganyika, T. T. 11. iii. 39.

Synonymy. Idjwi Island, long the home of Kandt, is in Lake Kivu, and I see no reason to regard Ahl's four 'species' as distinct. Laurent has recently (1941a, p. 152, pl. ix, figs. B. E. F. G.) figured the striking changes in pattern encountered in a developmental series of this species. He remarks that *kivuensis* is an extremely common frog in Kivu,

Urundi, Tanganyika, and the Katanga districts. The Ujiji record, however, is actually the first for its occurrence on the Tanganyika Territory side of the lake.

Variation. Outer finger with 1 joint free but webbing narrow on second; fourth toe with 1 joint free, outer toe feebly webbed to disk; tibio-tarsal articulation reaches eye.

Color. In life the Ujiji series were noted as being green, both series are now discolored by formalin but the dark canthal streak and lateral band may be more or less present in both sexes.

Size. Length of ♂♂ 30 mm., of ♀♀ 30–33 mm.

Hyperolius sp.

♂ (M. C. Z. 25171) Mushongero, U. 3. ii. 39.

Native name. Kitembi (Luganda).

Variation. Outer finger with 1 joint free except for a narrow seam, fourth toe with 1 joint free except for a narrow seam, outer toe webbed to disk; tibio-tarsal articulation reaches eye.

In the absence of females, this nondescript putty colored frog may, or may not, be referable to the foregoing or following species.

Size. Length of ♂ 34 mm.

Habitat. I captured this frog on a papyrus stem six feet above the surface of Lake Mutanda, the only one secured in two hours of paddling a dugout and using a flashlight, yet, to judge by their calls, these frogs were not uncommon.

Hyperolius alticola Ahl

Hyperolius alticola Ahl, 1931, Das Tierreich, no. 55, p. 379, fig. 255: Ruwenzori Mountains, 1800 metres, Belgian Congo.

♀ (M. C. Z. 25172) Mubuku Valley, Ruwenzori Mtns., U. 4. xii. 38.

Variation. Outer finger with 1 joint free except for a narrow seam, fourth toe with 1 joint free except for a narrow seam, outer toe webbed to disk; tibio-tarsal articulation reaches eye.

Color. In life. ♀. When caught, putty colored, but changed to: Above, head, back, and limbs, a dead-leaf rufous brown sparsely speckled with black; from nostril through eye a dark line which is continued on flank only as a series of dark spots; back anteriorly sparsely flecked with yellow; exposed portions of fore and hind limbs similarly

speckled. Below, throat and belly yellow, the latter on white; remaining under surfaces flesh-colored; palms and soles pink.

Size. Length of ♀ 37 mm., as was ♀ holotype.

Habitat. On leaf of a tall swamp plant at a height of seven feet. The altitude was about 1000 feet higher than that at which Schubotz took the type.

Hyperolius montanus (Angel)

Rappia montana Angel, 1924, Bull. Mus. Hist. Nat. Paris, **30**, p. 269: Mount Kinangop, Aberdare Mountains, Kenya Colony.

juv. (M. C. Z. 25173) S. Kinangop Plateau, K. C. 27. x. 38.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free, outer toe webbed to disk; tibio-tarsal articulation barely reaches eye. Compared with adult cotype and juvenile topotypes.

Size. Length 8 mm., tail recently absorbed.

Hyperolius undulatus (Boulenger)

Rappia undulata Boulenger, 1901, Ann. Mus. Congo (1), **2**, fasc. 1, p. 4, pl. ii, fig. 2: Pweto & Lofoi, Lake Mweru, Belgian Congo.

♂ (M. C. Z. 25299) Kitaya, T. T. iv. 39.

Native names. *Chitowa* (Kiyao); *kitowa* (Kimakonde), but applied to all species and *Chiromantis* and *Megalixalus* also.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free, outer toe webbed to disk; tibio-tarsal articulation reaches eye. Compared with adult cotype.

Size. Length 25 mm.

Hyperolius udjijiensis Ahl

Hyperolius udjijiensis Ahl, 1931, Das Tierreich, no. 55, p. 370, fig. 246: Ujiji, Tanganyika Territory (restricted).

1 ♂ 7 ♀ (M. C. Z. 25195–200) Ujiji, T. T. 11. iii. 39.

Remarks. Some years ago I (1933h, pp. 401–2) placed the cotype of *udjijiensis* from Kibwezi, Kenya Colony, in the synonymy of *striolatus* Peters, but pointed out that the Ujiji specimen, to which the name is now restricted, might prove to be distinct. The topotypic series now

obtained proves clearly that this is the case, in fact the relationship to the *callichromus* form of *argentovittis* is so close that in the field I was inclined to doubt their distinctness, thinking that *udjijiensis* might be a subadult phase, at least one female, however, is gravid.

If not an actual synonym of *H. vermiculatus* Peters, 1882 (not *vermiculatus* Pfeffer, 1893), of Mlange, Angola, the relationship would appear to be subspecific, to judge by comparing a 36 mm. gravid ♀ from Bella Vista, Angola, with a 34 mm. gravid ♀ from the Ujiji series.

Variation. Outer finger with 1 joint free, fourth toe with last joint narrowly webbed, outer toe fully webbed to disk; tibio-tarsal articulation reaches eye, or to between eye and nostril.

Size. Length of ♂ 32 mm., of ♀♀ 30–34 mm.

Hyperolius flavomaculatus Günther

Hyperolius flavomaculatus Günther, 1864, Proc. Zool. Soc. London, p. 310, pl. xxvii, fig. 1: Rovuma Bay, Tanganyika Territory.

·3 ♂ 1 ♀ (M. C. Z. 25201–4) Kitaya, T. T. 25–31. ii. 39.

Remarks. The above series are practically topotypes for my camp on the banks of the Rovuma River was scarcely twenty miles from the Bay where Kirk collected the type. Boulenger (1882 b, p. 128) transferred the species to *Megalixalus* and Parker wrote me that, after examining the type which until now has remained the only known specimen, he saw no reason to reverse Boulenger's action. The pigmentation, however, was so wholly like that of a *Hyperolius* that I felt sure the pupil must be horizontal, and visited Kitaya with the object of securing fresh material. The series obtained have horizontal pupils, as I noted in the field, and so I restore the species to its original allocation.

The Mt. Kenya and Mt. Mbololo frogs which I identified as *H. flavoguttatus* Ahl, have some webbing on the terminal joint of the fourth toe and represent a slightly larger (34 mm.) species.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free, outer toe webbed to disk; tibio-tarsal articulation reaches the eye.

Color. In life. ♂. Above, dusky yellow, heavily blotched or vermiculated with black; thighs and concealed portions of feet dull reddish; tibia dusky yellow with, or without, black vermiculations. Below, throat cream-colored (not yellow); interspace between disk and breast colorless like the lower flanks; median portion of breast and belly creamy white; limbs dull opaque red.

Size. Length of ♂♂ 28–29 mm., of ♀ 29 mm.

Habitat. Apparently a rare species as compared with *H. c. citrinus* with which it occurred in the same rice swamp, as also in another pond (B) where a pair were taken on grasses (*Setaria palmifolia*) much beloved by all the species of *Hyperolius* taken at Kitaya. I am indebted to the Gray Herbarium for identifying the specimens of this sedge which I brought back.

Hyperolius argentovittis Ahl

Hyperolius argentovittis A 1, 1931, Das Tierreich, no. 55, p. 345, fig. 220: Ujiji, Tanganyika Territory.

5 ♂ 15 ♀ (M. C. Z. 25205–9) Ujiji, T. T. 11. iii. 39.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free, outer toe webbed to, or almost to, disk; tibio-tarsal articulation reaches eye, or to between eye and nostril.

Color. In life. Above, maroon, a black-edged, pure white, vertebral line (*argentovittis*) in some, irregular or incomplete or broken up into spots (*callichromus* Ahl, 1931c, fig. 248) in others, from snout to anus.

Size. Length of ♂♂ 21–32 mm., of ♀♀ 30–36 mm., average 32 mm.

Breeding. On March 11 a male was taken calling from a tree in our camp beneath the mangoes and far from any water. The larger females were gravid, but the majority were not.

Enemies. One in stomach of a white-lipped snake (*Crotaphopeltis h. hotamboeia*) at Ujiji.

Hyperolius ahli Loveridge

Plate 3, figs. 1–2.

Hyperolius ahli Loveridge, 1936, Bull. Mus. Comp. Zoöl., **79**, p. 402: Lake Peccatoni, northeast of Witu, Kenya Colony.

2 ♂ 7 ♀ (M. C. Z. 25210–3) Kitaya, T. T. 1–4. iv. 39.
1 ♀ (M. C. Z. 25214) Lake Rutamba, T. T. 8. v. 39.

Variation. Outer finger with 1 joint free, fourth toe with last joint narrowly webbed, outer toe fully webbed to disk; tibio-tarsal articulation reaches to between eye and nostril, or nostril.

Color. The sexual dichromatism of this species was noted in the original description. In life these males rather resembled the straw-

colored *c. citrinus*, but the lateral streaks were clearer and the size larger. In the females the large spots were pale red broadly edged with black; limb surfaces which would be exposed when at rest were pale dusky brown; thighs and digits brick red.

Size. Length of ♂♂ 30–32 mm., of ♀♀ 30–33 mm.

Habitat. Taken at night on sedges in three different ponds, all Kitaya females were taken in one pond on April 4.

Hyperolius puncticulatus (Pfeffer)

Rappia puncticulata Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., **10**, p. 31, pl. ii, fig. 2: Zanzibar.

Hyperolius substriatus Ahl, 1931, Das Tierreich, no. 55, p. 358, fig. 234: Magrotto Mountain, near Tanga, Tanganyika Territory.

1 ♂ (M. C. Z. 25215) Amboni Estate, T. T. 17. vi. 39.
27 ♂ 8 ♀ 20 yng. (M. C. Z. 25216–29) Magrotto Mtn., T. T. 1–17. vii. 39.

Synonymy. The Museum of Comparative Zoölogy possesses a cotype of *substriatus* Ahl in addition to the long series of topotypes now secured; there seems to have been no reason for its having been described.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free or narrowly margined with web, outer toe webbed to disk; tibiotarsal articulation reaches eye (at all ages).

Color. In life. ♂ (M. C. Z. 25216). Above, orange yellow or yellowish green; from nostril over eye to above axilla a broad, mustard-colored band which is broadly edged with black above and below, posteriorly it breaks up into one (on right) or two (on left) black-edged, mustard-colored spots (but such spots are not only variable in number but may be entirely lacking *or* the dorso-lateral band may be continuous); an azygous, black-centred spot in lumbar region; thighs, except for a narrow band of orange yellow or yellowish green, like other concealed parts of hind limb when at rest, blood red. Below, gular disk and belly lemon yellow; remaining underparts greenish, more or less transparent and tinged with red.

Another Magrotto specimen, though taken with typical examples in sedges bordering a stream where it passed through a swamp, appeared so strikingly different in the field that I concluded it might be distinct. Its color was noted as follows: ♂ (M. C. Z. 25229). Above, pinkish brown, from nostril over eye almost to groin a broad, enamel-white band narrowly edged with light yellow and broadly with jet black

above and below; on either side of anus and on either heel are white spots similarly ringed with yellow and black; forearm, tibia, and feet speckled with black; thighs with dusky patches formed by minute speckling. Below, bright lemon yellow, gular disk sparsely flecked with brown; limbs, fingers, and toes show some transparent red.

♂ (M. C. Z. 25215). This 29 mm. variant is of the spotted type of which an example (M. C. Z. 9531) from Morogoro, where it occurs with more typically colored specimens, has been figured by Proctor (1920, p. 415, fig. 2). This condition comes about by persistence *as spots* (see also 26 mm. ♂ M. C. Z. 2521) of some of the faint lines which are to be observed in the young.

Five young, taken on July 6 during a search of fifty wild bananas at Kitulwe, were so variable that it was difficult to believe that all were of one species. Below, their throats were whitish, bluish, or rich emerald green; bellies white or bright yellow; hind limbs and feet showing much red.

Nine young, taken with five adults in sedges and on leaves of trees in a forest clearing, all possessed the U-shaped yellow canthal band, but the young had dusky lines on the dorsum; a dark-edged, light, vertebral line from snout to anus was present in some, and there was no red on the limbs of these juveniles.

Size. Length of ♂♂ 21–29 mm., average 26.7 mm., of ♀♀ 30–33 mm., average 32 mm., of young 11–24 mm.

Breeding. All females gravid.

Habitat. In sedges, domestic and wild bananas, and on trees in a forest clearing.

HYPEROLIUS MARIAE Barbour & Loveridge

Hyperolius mariae Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 217, pl. iii, fig. 1: Derema, Usambara Mountains, Tanganyika Territory.

12 ♂ 1 ♀ (M. C. Z. 25230–4) Siga Caves, T. T. 16. vi. 39.
20 ♂ 7 ♀ (M. C. Z. 25235–9) Amboni Estate, T. T. 17. vi. 39.

Variation. Outer finger with 1 joint free, fourth toe with 1 joint free, outer toe webbed to disk; tibio-tarsal articulation reaches eye or just beyond.

Color. In life. Below, hinder part of gular disk bright lemon yellow; belly usually white though sometimes red in either sex; limbs red.

The characteristic subdermal, black, lateral streak of *mariae* is present in all, but the dark canthal streak or circum-nasal spot is

very rarely present; this, in conjunction with the fact that these frogs average about 2 mm. shorter than the montane (3000 feet) *mariae* might cause some to regard *melanophthalmus* Ahl, 1931, as a recognizable lowland form. I doubt if Siga Caves and Amboni are much more than thirty-five miles from Derema as the crow flies.

Size. Length of ♂♂ 22–25 mm., average 23.5 mm., of ♀♀ 22–25 mm., average 23.1 mm.

Breeding. Calling in swamps near my camp at Siga and in one close to Amboni village; the females, taken June 16–17, are distended with eggs.

HYPEROLIUS CITRINUS SANSIBARICUS (Pfeffer)

Rappia sansibarica Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., **10**, p. 97, pl. ii, fig. 4: Zanzibar.

30 ♂ 5 ♀ (M. C. Z. 25251–6) Siga Caves, T. T. 14–16. vi. 39.
28 ♂ (M. C. Z. 25257–9) Amboni Estate, T. T. 17. vi. 39.

Remarks. When Pfeffer described *sansibaricus* he remarked on its similarity to *citrinus*, and as I can distinguish them only by size it seems advisable to regard the former (1893) as a smaller northern form of the latter (1864).

Variation. Outer finger, etc. as in typical form.

Color. In life. ♂. Below, throat bright lemon yellow. ♀. Below, throat whitish but tinged with yellow like the belly. In both sexes the thighs, back of knees, and such parts of the feet as would be concealed when at rest, blood red (*rubripes* Ahl).

Size. Length of ♂♂ 22–29 mm., average 25.4 mm., of ♀♀ 26–32 mm., average 29 mm.

Breeding. Though the rains were drawing to a close, the swamps still resounded with the sharp "snap-snap" call of the males. All five females were distended with ova.

Enemies. One was entangled in the strong mesh of a spider's web which had been woven between the sedges, another was recovered from the stomach of a larger frog (*Rana edulis*).

HYPEROLIUS CITRINUS CITRINUS Günther

Hyperolius citrinus Günther, 1864, Proc. Zool. Soc. London, p. 311, pl. xxvii, fig. 2: Senegal (rejected) and Zambezi Expedition (restricted). ?Possibly from Rovuma Bay, Tanganyika Territory (A. L.)

120 ♂ 13 ♀ (M. C. Z. 25240–5) Kitaya, T. T. 25–31. iii. 39.
11 ♂ 2 ♀ (M. C. Z. 25246–50) Mikindani, T. T. 8–20. iv. 39.

Remarks. In his report on the material received from Livingstone and Kirk's "Zambezi Expedition", Günther figured (1864, pl. xxvii) *H. flavomaculatus* and *microps* from Rovuma Bay and a third species, *citrinus,* based on two males, from Senegal and Zambezi Expedition. This does not necessarily imply that *citrinus* came from the Zambezi, and we know that Livingstone tramped over the low hills from Mikindani to some point on the Rovuma near to the site where the little village of Kitaya stands today.

Of the three frogs—*flavomaculatus*, *microps*, and *citrinus*—which I collected at Kitaya, the latter was by far the commonest and the males bore a striking resemblance to the male figured by Günther. Perhaps the original label of *citrinus* was illegible or lost, hence "Zambezi Expedition" only. However that may be, I propose to restrict the type to the Zambezi Expedition frog and reject the Senegal specimen as being unlikely to be conspecific. Unfortunately, owing to war conditions, it would be impossible to get further light on this subject from the British Museum.

Variation. Outer finger with almost 2 joints free, for second only narrowly margined with web, fourth toe with 1 joint free and second only narrowly margined with web on one side, outer toe with last joint half webbed or continued as a narrow seam to disk; tibio-tarsal articulation reaches eye or nostril.

Color. In life. ♂. Above, green, dusky yellow, or straw brown, paler on flanks, which are demarcated from the back by a rather indistinct (disappears on preservation) cream-colored, dorsolateral line commencing high above axilla and terminating high above groin; thighs largely colorless but tinged with red by blood vessels one of which is clearly visible as a fine red line. Below, gular disk chrome; breast and belly pure white; interspace between disk and breast semitransparent like all remaining underparts.

To ascertain the proportion of the two dominant color phases in regard to sex, catches made in three separate ponds on three different days were sorted and noted down as follows:

19 straw ♂♂,	19 green ♂♂,	1 green ♀.
36 " ♂♂,	15 " ♂♂,	1 " ♀.
16 " ♂♂,	1 " ♂♂,	1 " ♀.

Size. Length of ♂♂ 28–34 mm., of ♀♀ 34–38 mm.

Thus *citrinus* is a larger frog but otherwise does not differ from *sansibaricus;* unfortunately no measurements were given for either type, and I failed to note that of the latter when examining the type some

years ago. I did, however, find it resembled our specimens from Bagamoyo, which is on the mainland exactly opposite Zanzibar. The position is best set forth by listing the measurements of all the material in the Museum of Comparative Zoölogy. All places are in the coastal belt—Kilosa being the furthest inland—and are arranged below from north to south.

Localities in Kenya and Tanganyika.			Length ♂♂.	Length ♀♀.
Kililani (Berlin ♂ and ♀ cotypes of *rubripes*).				32 mm.
Mkonumbi	6 ♂♂		26–30 mm.	
Peccatoni	6 ♂♂	4 ♀♀	26–29 mm.	30–33 mm.
Witu	15 ♂♂	1 ♀	23–28 mm.	29 mm.
Ngatana		1 ♀		30 mm.
Karawa				30 mm.
Malindi	1 ♂		31 mm.	
Amboni	28 ♂♂		22–28 mm.	
Siga Caves	30 ♂♂	5 ♀	25–29 mm.	26–32 mm.
Bagamoyo	3 ♂♂		26–28 mm.	
Dar es Salaam	1 ♂		30 mm.	
Zanzibar (Hamburg type *sansibaricus*).				?
Summary of 90 ♂♂ 13 ♀♀ *c. sansibaricus*			22–31*mm.	26–33 mm.
Kilosa		1 ♀		38 mm.
Mikindani	11 ♂♂	2 ♀♀	31–34 mm.	35–38 mm.
Kitaya	120 ♂♂	13 ♀♀	28–34 mm.	34–36 mm.
Summary of 131 ♂♂ 16 ♀♀ *c. citrinus***			28–34 mm.	34–38 mm.

Breeding. On March 25, on all sides, males might be heard calling vociferously; the call consisting of an explosive double click or snap. Most of the females taken were gravid, their scarcity, relative to the males, apparently indicating that the breeding season was largely over. One mass of eggs was found at the base of a rice plant just above water level, the latter having recently subsided.

Hyperolius parkeri parkeri Loveridge

Plage 3, figs. 3–4.

Hyperolius parkeri Loveridge, 1933, Bull. Mus. Comp. Zoöl., **74**, p. 410: Bagamoyo, Tanganyika Territory.

1 ♂ (M. C. Z. 25270) Siga Caves, T. T. 16. vi. 39.
13 ♂ 4 ♀ (M. C. Z. 25271–9) Amboni Estate, T. T. 17. vi. 39.

*Only 1 frog of the 90 attains 31 mm.
**Only 7 frogs of 131 under 30 mm., average 31 mm.

Variation. Outer finger with almost 2 joints free for second only narrowly margined with web, fourth toe with 1 joint free the second being well webbed, outer toe webbed to, or almost to, disk; tibiotarsal articulation reaches eye or nostril (in both sexes).

Size. Length of ♂♂ 21–24 mm., average 23 mm., of ♀♀ 19–21 mm., average 19.7 mm.

Breeding. On June 17 males were observed emitting their trilling call; females, taken on the same date, were all gravid.

Hyperolius parkeri rovumae subspec. nov.

Plate 3, figs. 5–6.

9 ♂ 5 ♀ (M. C. Z. 25260–9) Kitaya, T. T. 31. iii–4. iv. 39.

Type. Museum of Comparative Zoölogy, No, 25260, a gravid ♀ from Kitaya, Rovuma River, Lindi Province, southeastern Tanganyika Territory. Collected by Arthur Loveridge, March 31, 1939.

Paratypes. Museum of Comparative Zoölogy, Nos. 25261–25269, being 13 specimens as listed above.

Diagnosis. Principal differences from *H. p. parkeri* Loveridge are as follows:

Breeding spinosites of males confined to hind feet; sexes dichromatic; females without a well-defined, black-edged canthal and lateral band, *at most* indicated by an upper and lower series of black spots; size smaller, ♂♂ 21–24 mm., ♀♀ 19–21 mm.; range: From Witu, Kenya Colony, south along coast to Dar es Salaam, Tanganyika Territory. *p. parkeri*

Breeding spinosities of males on belly, thighs, and soles of feet; females resemble males in possessing a well-defined, black-edged, cantho-lateral band; size larger, ♂♂ 24–27 mm., ♀♀ 21–23 mm.; range: Kitaya, Rovuma River, 275 miles south of Dar es Salaam. *p. rovumae*

Description. Outer finger with 2 joints almost free for second only narrowly margined with web; fourth toe with 1 joint free or narrowly margined with web, outer toe webbed to disk; tibio-tarsal articulation reaches between eye and nostril, or to nostril.

Color. In life. ♂ Paratype. Above, dark brown, back minutely punctate with brown; from nostril through and above orbit along flanks to groin a broad white band, edged above and below by lines formed by a concentration of dusky spots; limbs clear, transparent brown stippled with black, such stippling forming large spots on fore-

arm and tibia; thigh tinged with pink from subcutaneous blood vessels. Below, pale buffy-white; buccal borders finely punctate with black; rest of undersurface translucent flesh color.

In life. ♀ Type. Above, dark green, back minutely punctate with black; from nostril through and above orbit along flanks to groin a broad white band, edged above and below by black; limbs a clear, but paler, green, immaculate on thigh and foot but stippled with brown on forearm and tibia. Below, throat verdigris green; belly largely transparent so that eggs are clearly discernible; limbs and feet transparent green.

Size. Length of ♂♂ 24–27 mm., average 25.3 mm., of ♀♀ 21–23 mm., average 21.8 mm. Length of type ♀ 23 mm.

Hyperolius nasutus Günther

Hyperolius nasutus Günther, 1864, Proc. Zool. Soc. London, p. 482, pl. xxxiii, fig. 3: Duque de Bragança, Angola.

9 ♂ (M. C. Z. 25280–4) Kitaya, T. T. 25–30. iii. 39.
16 ♂ 5 ♀ (M. C. Z. 25285–9) Amboni Estate, T. T. 17. vi. 39.

Remarks. It might be pointed out that breeding males can be distinguished from those of *parkeri* by the absence of black spinosities, they are a brighter green and the dorso-lateral band is narrower and not edged above and below with black.

Variation. Outer finger with almost 2 joints free for second only narrowly margined with web, fourth toe with 1 joint free and second moderately webbed, outer toe with last joint half-webbed; tibio-tarsal articulation reaches eye or nostril (in both sexes).

Color. In life. ♂. Above, pale green, head alone minutely punctate with brown; from above eye (only rarely from nostril) along flanks to groin a white band; limbs a clear, pale green; thigh immaculate except for a subcutaneous blood vessel showing as a red line; forearm, tibia, and exposed surface of foot stippled with black. Below, gular disk yellow; throat dark green; belly pure white; limbs colorless except for a faint greenish tinge; feet colorless except for a slight yellowish tinge.

Size. Length of ♂♂ 20–24 mm., average 22.8 mm., of ♀♀ 21–23 mm., average 22 mm.; a tailed froglet measures 17+15 mm.

Breeding. The above-mentioned froglet was taken about March 30. On June 17 all five females were distended with ova which are clearly visible through the semitransparent abdominal wall.

Hyperolius pusillus (Cope)

Plate 3, figs. 7–8.

Crumenifera pusilla Cope, 1862, Proc. Acad. Nat. Sci. Philadelphia, p. 343: Umvoti, Natal. (♀).

Hyperolius microps Günther, 1864, Proc. Zool. Soc. London, p. 311, pl. xxvii, fig. 3: Rovuma Bay, Tanganyika Territory. (♂).

Hyperolius milnei Loveridge, 1935, Bull. Mus. Comp. Zoöl., **79**, p. 18: Witu, Coast Province, Kenya Colony. (♀).

12 ♀ ♀ (M. C. Z. 25290–8) Kitaya, Rovuma River, T. T. 4. iv. 39.

Synonymy. These are practically topotypes of *microps* Günther, with which *milnei*, from a locality 500 miles further north, appears conspecific as I (1941h, p. 291) have recently suggested. They would appear to differ from *pusillus* (inc. *translucens* Power) of which we have good topotypic series, in generally exhibiting a black spot on knee and heel. This, however, is by no means constant in the big series of *milnei* and is absent in a series from Golbanti, Tana River, as well as from the types of *usaramoae* Loveridge, from Dar es Salaam. I prefer, therefore, to regard all as representing one species which is very variable in the size of the dorsal spots which may be present or absent.

Variation. Outer finger with 1 joint free, fourth toe with last joint narrowly webbed, outer toe fully webbed to disk; tibio-tarsal articulation reaches eye *or nostril.*

Color. In life. ♀. Above, head and anterior part of back rich green; from nostril to orbit a line of relatively large black spots sometimes coalescing, others are scattered over head and anterior part of back, in addition the entire upper surface is peppered by minute black points (visible only with a lens); back posteriorly, as well as limbs, a paler green; fingers and toes bright orange. Below, pale bluish green, breast silvery white.

Size. Length of ♀ ♀ 20–23 mm., average 21 mm.

Habitat. Though especial search was made for this species in several small swamps we failed to find it until, almost at the end of our stay, I located them in the leech- and crocodile-infected lagoon some miles below our camp in the direction of Rovuma Bay.

RANIDAE

ARTHROLEPTIDES MARTIENSSENI Nieden

Arthroleptides martiensseni Nieden, 1910, Sitz. Ges. naturf. Freunde Berlin, p. 445: Amani, Usambara Mountains, Tanganyika Territory.

♂ ♀ & juv. (M. C. Z. 25380–2) Magrotto Mtn., T. T. 3. vii. 39.

Color. In life. ♂. Above, dark olive with a brown interorbital bar; from nostril to eye, and from eye over tympanum to axilla, a rather indistinct dark band; lips dark brown flecked with white; limbs, fingers and toes blotched with brown. Below, throat slightly brown flecked with white; belly, and remaining underparts, whitish tinged with yellow towards the sides; palms and soles dark brown.

Size. Length ♂ 57 mm., ♀ 67 mm., young 22 mm.

Habitat. The male was shot as he squatted on a sloping rock far in under an overhanging slab at the side of a torrent, the others were taken beneath vegetable debris or logs in the sodden rain forest.

RANA ALBOLABRIS ALBOLABRIS Hallowell

Plate 4, fig. 3.

Rana albolabris Hallowell, 1856, Proc. Acad. Nat. Sci. Philadelphia, p. 153: West Africa.

8 (M. C. Z. 25301–4) Idjwi Id., B. C. 20–28. ii. 39.

Native name. *Mote* (Lulega).

Variation. Snouts somewhat intermediate between topotypical Liberian *R. a. albolabris* and a paratype Angolan *R. a. parkeriana* Loveridge, 1941 (n.n. for *acutirostris* Parker, 1936, preoccupied by *acutirostris* Fatio, 1872).

Size. Length 44–61 mm., average 54.7 mm.

Breeding. Nonbreeding, possibly subadult.

Diet. Black crickets, ant, ? stone fly, spider, slug, snail.

RANA GALAMENSIS BRAVANA (Peters)

Limnodytes bravanus Peters, 1882, Sitz. Ges. naturf. Freunde Berlin, p. 3: Barawa, *i.e.* Brava, Italian Somaliland.

3 ♂ 3 ♀ (M. C. Z. 25305–6) Ujiji, T. T. 11. iii. 39.

Size. Length ♂♂ 64–74 mm., ♀♀ 63–74 mm.

Breeding. Not breeding.

Diet. In one stomach a cricket, caterpillars, and a large (15 mm. long) shield bug; nothing in stomachs of three emaciated frogs taken from deep water in an old sugar vat from which there was no way of escape.

Rana fuscigula fuscigula Duméril & Bibron

Rana fuscigula Duméril & Bibron, 1841, Erpét. Gén., **8**, p. 386: South Africa.

1 ♂ 16 ♀ (M. C. Z. 25315–9) Mushongero, U. 1. ii. 39.

Native name. Senyamiganda (Lukiga for all ranids).

Variation. Characters of *fuscigula*, viz.: Length of tibia not more than half the length from snout to anus; fifth toe webbed to the very tip, but not so fully as in *R. f. chapini*.

Size. Length ♂ 55 mm., ♀♀ 60–75 mm., average 70 mm.

5 ♂ 15 ♀ 13 juv. 2 tad. (M. C. Z. 25320–5) Mushongero, U. 1. ii. 39.

Variation. Characters of *fuscigula* and *chapini*, i. e. intermediates viz.: Length of tibia *more* than half the length from snout to anus; fifth toe webbed to the very tip (except for the two smallest young, M. C. Z. 25322–3, whose condition shows an approach to that of *f. angolensis*) but not so fully as in *R. f. chapini;* size that of *fuscigula* and not of *chapini*.

Size. Lengths ♂♂ 49–54 mm., ♀♀ 50–70 mm., average 62 mm., young 35–45 mm., average 39 mm. tadpoles 55–76 mm.

Enemies. One frog recovered from stomach of a green snake (*Chlorophis irregularis*).

Rana fuscigula chapini Noble

Rana chapini Noble, 1924, Bull. Am. Mus. Nat. Hist., **49**, p. 214, fig. 6a: Batama, Belgian Congo.

3 ♂ 1 ♀ 15 juv. (M. C. Z. 25326–9) Budongo Forest, U. 23. xi. 38.
2 ♀ 1 juv. (M. C. Z. 25330–2) Kibale Forest, U. 9. xii. 38.
4 ♂ 5 ♀ 4 juv. (M. C. Z. 25333–7) Magrotto Mtn., T. T. 5. vii. 39.

Variation. Length of tibia more than half the length from snout to anus; fifth toe webbed to the very tip though in some of the smallest Budongo and Kibale specimens rather less fully than in the adults, *i.e.* showing an approach to the (? ancestral) condition found in *R. f. angolensis*.

Size. Length ♂♂ 60–65 mm., ♀♀ 65–90 (75–76 at Kibale, 84 Budongo, 65–90 Magrotto) mm., young 27–59 mm., average 40 mm., tailed young 25 + 15, 26 + 12, and 27 + 16 mm.

Habitat. In or beside streams in the forest in all three localities, of which Kibale appeared to be the driest.

RANA FUSCIGULA ANGOLENSIS Bocage

Rana angolensis Bocage, 1866, Jorn. Sci. Lisboa, **1**, p. 73: Duque de Bragança, Angola.

1 juv. (M. C. Z. 25307) Mabira Forest, U. 11. xi. 38.
6 ♂ 1 ♀ 5 juv. (M. C. Z. 25308–12) Mubuku Valley, U. 31. xii. 38.
1 ♀ 5 juv. (M. C. Z. 25313–4) Kisenyi, B. R. 9. ii. 39.

Native name. Lulenga (Luganda for all ranids).

Variation. Length of tibia very variable but always more than half the length from snout to anus; fifth toe with last phalange free of web.

Color. Very variable, the most striking variant being one from the Mubuku Valley which, in life, was: Above, rich reddish brown, a broad, dull golden, vertebral stripe, edged with black anteriorly, from snout to anus.

Size. Length ♂♂ 45–52 mm., ♀♀ 60–70 mm., young 25–47 mm., average 39.6 mm.

Habitat. Boulenger recorded and figured frogs from the Mubuku Valley, Ruwenzori Mountains, under the name of *Rana nutti*, which I regard as a synonym of *angolensis*. It might reasonably be expected that frogs from this forested region would have been referable to the sylvicoline race *chapini*, instead we must assume that the valley has been populated by frogs ascending the Mubuku River from the savanna surrounding the eastern foot of the mountain. In Mabira the hot savanna is everywhere encroaching on the forest though actually I captured our single specimen in a rain-filled rut of the track which passes through a stretch of forest.

RANA CHRISTYI Boulenger

Rana christyi Boulenger, 1919, Revue Zool. Africaine, **7**, p. 5: Madié, i.e. Medje, Ituri Forest, Belgian Congo.

♀ (M. C. Z. 25369) Budongo Forest, U. 29. xi. 38.

Distribution. This constitutes the first record of the occurrence of this species in Uganda. In the Congo it has been confused with *aequip-*

licata Werner, (which is a synonym of *longirostris* Peters, *fide* Nieden (1908) who compared the types of both), first by Noble (1924) for two of his Boyulu "*christyi*" (now M. C. Z. 6612–3) are really *longirostris*, and later by Witte (1934, p. 171) for six of his Dika series of "*aequiplicata* (now M. C. Z. 17956–7, 21757–60) are really *christyi*, though at least two of his Djamba frogs (now M. C. Z. 17958–9), mentioned in the same paper, were correctly identified as *christyi*.

Variation. Toes of the hind limb, taken in order from first to fifth, exhibit the following phlanges free of web: 1½, 1, 1, 2, 0.

Color. In life. ♀. Above, yellow leaf-brown, a short, transverse, interorbital, black bar; round snout to behind tympanum a rich black streak; back irregularly flecked with black, the dorso-lateral glandular fold carrying a series of black dashes; flanks with a few flecks of black; forelimbs and feet distinctly, hind limbs indistinctly, barred with black; thighs posteriorly bright mustard yellow marbled with black; hind feet yellowish faintly tinged with pink. Below, throat cream-colored; belly bright lemon yellow; limbs yellowish; soles of forefeet light with dusky markings, those of hind feet black.

Size. Length ♀ 51 mm.

Habitat. Captured while taking tremendous leaps over the sodden, leaf-strewn, forest floor.

Rana oxyrhynchus oxyrhynchus Smith

Rana oxyrhynchus A. Smith, 1849, Ill. Zool. S. Africa, Rept., pl. lxxvii, figs. 2–2c: Kaffirland & region of Port Natal, South Africa.

♂ (M. C. Z. 25338) Budongo Forest, U. 30. xi. 38.
4 ♂ 1 ♀ (M. C. Z. 25339–40) Kisenyi, B. R. 9. ii. 39.
♀ (M. C. Z. 25341) Mikindani, T. T. 8. iv. 39.
1 juv. (M. C. Z. 25342) Mbanja, T. T. 3. v. 39.
8 juv. (M. C. Z. 25343) Siga Caves, T. T. 9. vi. 39.
♀ (M. C. Z. 25344) Magrotto Mtn., T. T. 1. vii. 39.
♀ (M. C. Z. 25345) Tanga township, T. T. 23. vii. 39.

Native names. *Nanhengo* and *nanihengo* (Kimakonde at Kitaya and Mbanja respectively); *nanmiengo* (Kimawiha). But all applied to *R. m. mascareniensis* also.

Variation. Fourth toe with 1½–2 phlanges free of web, all other toes webbed to the tip except in very young frogs where the webbing is a little less extensive, the Mbanja froglet, for example, has the terminal phlange of the third toe apparently free.

Color. In life, of an unusually colored ♀ from Magrotto. Above, gray, but so heavily overlaid and mottled with black as to appear black; from nostril a line passes below eye to base of forearm; the dorsolateral glandular fold and a line on hinder side of thigh from anus to back of knee, whitish or greenish. Below, lips flecked with white; throat silvery white flecked with gray merging into the slightly yellowish belly coloring, distinctly yellowish on its periphery and on hind limbs.

Size. Length ♂♂ 41–45 mm., ♀♀ 41–54 mm., young 19–26 mm.

Breeding. From February 9 to June 20 all females were gravid, their abdomens distended with ova; the female taken on July 23, however, had finished spawning.

Habitat. It should be explained that the Magrotto frog was taken in a swamp in open country far down the mountain; had it been captured in the forest one would have expected the sylvicoline form which follows.

RANA OXYRHYNCHUS GRIBINGUIENSIS Angel

Rana (Ptychadena) Gribinguiensis Angel, 1922, Bull. Mus. Hist. Nat. Paris, **28**, p. 399, fig. —: Fort Crampel, Lake Chad, French West Africa.

♀ (M. C. Z. 25346) Amboni Estate, T. T. 20. vi. 39.

Variation. Fourth toe with 1 phlange free as is characteristic of this large race.

Size. Length ♀ 58 mm.

Breeding. Gravid, distended with ova.

Habitat. Taken in the patch of forest, beside which I was camped, or on the nearby land which was being cleared by tractors. To find this large and unmistakable montane-forest form—so far as the east is concerned—almost at sea-level, was a considerable surprise.

RANA MASCARENIENSIS MASCARENIENSIS Duméril & Bibron

Rana Mascareniensis Duméril & Bibron, 1841, Erpét. Gén., **8**, p. 350: Madagascar; Mauritius; Seychelles.

2 ♂ 2 ♀ (M. C. Z. 25347–50) Kinangop Plateau, K. C. 29. x. 38.
7 juv. (M. C. Z. 25351–2) Kitaya, Rovuma R., T. T. 28. iii. 39.
♀ (M. C. Z. 25353) Siga Caves, Tanga, T. T. 9. vi. 39.
♀ (M. C. Z. 25354) Tanga township, T. T. 22. vii. 39.

Native names. The same as for *R. o. oxyrhynchus.*

Variation. Toes of the hind limb, taken in order from first to fifth, exhibit the following phlanges free of web: 2, 1½, 2, 3, 1½ for the

series from Kinangop at 10,000 feet, and 1–1½, 1–1½, 1–1½, 2½–3, 1–1½ on those from the coastal belt almost at sea-level. The allocation of the Kinangop series to the typical race, therefore, may be regarded as tentative. They are separated from the larger western, and eastern montane, race apparently only by size!

Size. Length ♂♂ 41–42 mm., ♀♀ 34–48 mm., young 13–33 mm.

Breeding. On October 29 males were calling "quek-quek" and females spawning in rain-filled pools along a cart track traversing the plateau. On March 28 and June 9 newly emerged young were numerous.

Enemies. Two young were recovered from the stomach of an egret (*Egretta g. dimorpha*) and one from a house snake (*Boaedon l. lineatus*) near the Siga Caves.

Rana mascareniensis venusta Werner

Rana venusta Werner, 1907, Sitz. Akad. Wiss. Wien, **116, 1**, pp. 1889 and 1892, pl. iv. fig. 11: Entebbe, Uganda; Mongalla, Belgian Congo; and Lagos, Nigeria.

1 ♀ 2 juv. (M. C. Z. 25355–6) Budongo Forest, U. 30. xi. 38.
1 juv. (M. C. Z. 25357) Kibale Forest, U. 16. xii. 38.
1 juv. (M. C. Z. 25358) Nyakabande, U. 28. i. 39.
3 ♂ (M. C. Z. 25359–60) Mushongero, U. 1. ii. 39.
6 ♂ 3 ♀ (M. C. Z. 25361–2) Kisenyi, B. R. 9. ii. 39.
1 ♂ 7 ♀ 6 juv. (M. C. Z. 25363–4) Idjwi Id., B. C. 25. ii. 39.
4 ♂ 2 ♀ (M. C. Z. 25365–6) Ujiji, T. T. 11. iii. 39.
3 ♂ 2 ♀ (M. C. Z. 25367–8) Magrotto Mtn., T. T. 1. vii. 39.

Native name. *Marembera* (Lulega).

Variation. Toes of the hind limb, taken in order from first to fifth, exhibit the following phlanges free of web: 1–2, 1–1½, 1–1½, 2–3, 1–1½. The tibio-tarsal articulation of the adpressed hind limb, in both this *and* the typical form, reaches the end of the snout or beyond, both conditions being found in any locality from which an adequate series is available. This apparently reduces the recognition of *venusta* as a western, or forest, form to a matter of size.

Size. Length ♂♂ 40–53 mm., ♀♀ 52–65 mm., young 20–46 mm.

Breeding. On November 30, juvenile frogs measured 20–22 mm. and increased more or less progressively to February 25, when those of 30–46 mm. were encountered.

Habitat. The Budongo frogs were sitting on a grassy bank beside a ditch across which they leaped into sedges of a small swamp separat-

ing road from forest. The Kibale frog was in a swamp by palms without the forest. The Idjwi series were on the lake shore. Ujiji in a sugar vat. The Magrotto series in a swamp near, but outside, the forest.

Rana occipitalis Günther

Plate 4, fig. 4.

Rana occipitalis Günther, 1858, Cat. Batr. Sal. Brit. Mus., p. 130, pl. xi: West Africa; Africa; Gambia.

1 ♂ 2 ♀ (M. C. Z. 25370–1) Ujiji, T. T. 11. iii. 39.

Size. Length ♂ 97 mm., ♀ ♀ 125–125 mm.

Diet. Bones of a small frog and a large Dytiscid beetle (*Cybister* sp.) in one.

Breeding. Apparently not; spawn small in females.

Rana edulis (Peters)

Pyxicephalus edulis Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 626: Boror; Mozambique; and Tete, Mozambique.

1 juv. (M. C. Z. 25372) Kitaya, T. T. 31. iii. 39.
3 ♀ 3 juv. (M. C. Z. 25373–7) Mikindani, T. T. 10. iv. 39.
4 juv. (M. C. Z. 25378) Siga Caves, T. T. 15. vi. 39.
1 juv. (M. C. Z. 25379) Amboni Est., T. T. 17. vi. 39.

Native names. Liola (Kiyao); *kitowa* (Kimakonde, but also for *Chiromantis!*).

Size. Length ♀ ♀ 125–145 mm., young 29–115 mm.

Breeding. On June 15 the ground was literally a-hop with hundreds of emergent frogs which had come from a large swamp and were seeking shelter under bundles of grass and among the rubble of a collapsed hut.

Diet. These bullfrogs seem impervious to stings, for example, the stomach of one Mikindani frog held: 3 scorpions each measuring $1\frac{1}{4}''$ from head to end of sting, a centipede $4''$ long and $1/3''$ broad, a millipede $2\frac{3}{4}''$ long, a scutigera, a carabid beetle $1\frac{1}{2}''$ long of a species that ejects formic acid, 3 black "stink" ants $11/16''$ long, remains of a snail with shell $7/16''$ diameter.

From other stomachs a frog (*Hyperolius e. sansibaricus*), 2 scorpions, 4 millipedes, a tenebrionid beetle $1\frac{1}{2}''$ long, 3 hard-shelled tenebrionids

each about $\frac{3}{4}''$ long without their heads, a nymph, and a hard black tip of a sisal (aloe) leaf, the thorn measuring 1″ in length.

Enemies. In their turn these big frogs are eaten by natives of the Mawiha tribe and two tailed tadpoles were recovered from the stomach of an egret (*Egretta g. dimorpha*). At Kitaya a frog was brought in which lacked a left hind leg, if it had ever had one, the place was completely healed over though the frog was 60 mm. long.

PHRYNOBATRACHUS spp.

Recently Dr. Laurent, (1941b, p. 192) has discussed the subgenera of Phrynobatrachus, his conclusions being based on his own anatomical investigations; the following list in which the species are arranged according to disks, webbing, and habitat, conforms very nearly with his views except that *graueri* is anatomically affiliated with the first five species listed, *i.e. Phrynobatrachus* (*sensu strictu*) and not with the last three, which he refers to *Natalobatrachus*.

As the digital disk, when present, occupies much of the terminal phlange, *a toe that is webbed to the disk is here considered to have one phlange free*, the necessity for such a rating is apparent when, as is not infrequently the case, the digital expansion dries or macerates, or when one has to compare the extent of webbing with such a species as *natalensis*.

The list refers only to the material in the present collection, every individual of which—except in the case of the long series from Idjwi Island—has been examined.

Species	Disks present	Phlanges on toes free of web					Habitat
		1st.	2nd.	3rd.	4th.	5th.	
natalensis	No	1	1	2	3	2	savanna swamp
perpalmatus	Yes	1	1	1	1–1½	1	"
acridoides	Yes	1	1	1	2	1	"
kinangopensis	Just	1	1	1	2	2	" [1]
plicatus	Yes	1	1	1	2	1	forest pool
krefftii	Yes	1	1	1	2	1	"
dendrobates	Yes	1	1	2	3	2	"
versicolor	Yes	1	1	2	3	2–2½	" [2]
graueri	Yes	1–1½	1½–2	2–2½	3–3½	2–2½	forest & vic.

[1]In alpine meadows at 10,000 feet.
[2]See remarks under *Habitat*.

PHRYNOBATRACHUS NATALENSIS (Smith)

Stenorhynchus natalensis A. Smith, 1849, Ill. Zool. S. Africa, Rept., App., p. 24: Natal, Union of South Africa.

2 ♂ (M. C. Z. 25432–3) Mabira Forest, U. 15. xi. 38.
8 hgr. (M. C. Z. 25434–5) Budongo Forest, U. 23. xi. 38.
1 ♂ 1 ♀ (M. C. Z. 25436–7) Ujiji, T. T. 11. iii. 39.

Native name. *Lulenga* (Luganda for all ranids).

Variation. Tibio-tarsal articulation reaches eye (♂ ♀) or nostril (♀). See also under *Phrynobatrachus.*

Color. A narrow, light, vertebral line in one Budongo frog only.

Size. Length ♂♂ 31–32 mm., ♀ 31 mm.; halfgrown 25–29 mm.

Breeding. On November 11, males calling from pool.

Enemies. One recovered from the stomach of a one-streaked hawk (*Kaupifalco monogrammicus*) at Kitaya.

Habitat. Both Mabira and Budongo series were taken *outside* the forest in a pool and stream respectively; the Ujiji pair were in an abandoned sugar vat from which there was no means of escape.

PHRYNOBATRACHUS PERPALMATUS Boulenger

Phrynobatrachus perpalmatus Boulenger, 1898, Proc. Zool. Soc. London, pl. xxxviii, fig. 1: Lake Mweru, Northern Rhodesia.

10 ad. 7 juv. (M. C. Z. 25414–8) Ujiji, T. T. 11. iii. 39.

Variation. Tibio-tarsal articulation reaches eye, sometimes only barely. See also under *Phrynobatrachus.*

Color. A broad, light, vertebral line in two frogs only; the longitudinal dusky lines on hinder and lower aspect of thighs are characteristic and an aid to identification.

Size. Length 19–24 mm., young 10–14 mm.

Habitat. Calling from swamped grasslands near the lakeshore.

PHRYNOBATRACHUS ACRIDOIDES (Cope)

Staurois acridoides Cope, 1867, Journ. Acad. Nat. Sci. Philadelphia, **6**, p. 198: Zanzibar.

2 (M. C. Z. 25426–7) Kitaya, T. T. 4. iv. 39.
12 (M. C. Z. 25428–9) Mikindani, T. T. 11. iv. 39.
3 (M. C. Z. 25430–1) Siga Caves, T. T. 8. vi. 39.

Variation. Tibio-tarsal articulation reaches eye or nostril, in young even to end of snout. See also under *Phrynobatrachus.*

Color. A broad, or narrow, vertebral line in 3 Mikindani males and 2 Siga females only.

Size. Length ♂♂ 25–27 mm., ♀♀ 26–30 mm., young 17–23 mm.

Breeding. On April 11 males were numerous (7 to 3 females) and calling, a hind-limbed tadpole measuring 14 + 32 mm. is presumed to be this species. Males are recognizable by their dark throats which become roughened at this season by accentuation of the dermal granulations.

Habitat. At Mikindani in swamped grasslands beneath the coconuts, at Siga on a swampy path beside the Mkulumusi River.

Phrynobatrachus kinangopensis Angel

Phrynobatrachus Kinangopensis Angel, 1924, Bull. Mus. Hist. Nat. Paris, **30**, p. 130: Mount Kinangop, Aberdare Mountains, Kenya Colony.

2 (M. C. Z. 25424–5) S. Kinangop Plateau, K. C. 29. x. 38.

Variation. Tibio-tarsal articulation reaches tympanum. See also under *Phrynobatrachus.*

Size. Length ♂♂ 14–19 mm.

Habitat. In a rain-filled pool beside road at 10,000 feet.

Phrynobatrachus plicatus (Günther)

Hyperolius plicatus Günther, 1858, Cat. Batr. Sal. Brit. Mus., p. 88, pl. vii, fig. C: Coast of Guinea.

1 (M. C. Z. 25419) Budongo Forest, U. 29. xi. 38.

Distribution. New for Uganda, though long known from the Ituri Forest of the Belgian Congo.

Variation. Tibio-tarsal articulation reaches far beyond end of snout. See also under *Phrynobatrachus.*

Size. Length 25 mm.

Habitat. In ditch at forest edge.

Phrynobatrachus krefftii Boulenger

Phrynobatrachus krefftii Boulenger, 1909, Ann. Mag. Nat. Hist. (8), **4**, p. 496: Amani, Usambara Mountains, Tanganyika Territory.

5 (M. C. Z. 25420–3) Magrotto Mtn., T. T. 8. vii. 39.

Variation. Tibio-tarsal articulation reaches eye or end of snout. See also under *Phrynobatrachus.*

Color. In life. ♂. Above, olive mottled with black; limbs barred with black. Below, throat rich yellow, posteriorly crossed by a broad dusky band vermiculated with white; rest of undersurface whitish faintly tinged with yellow and spotted with pale brown, principally along outer part of limbs; palms and soles black.

♀. Above, as in male. Below, whitish with dusky markings as in male but the post-gular band is much less clearly defined.

Size. Length ♂♂ 31–36 mm., ♀♀ 33–41 mm.

Habitat. Some were taken in stony puddles formed by a spring issuing from the mountainside in deep forest, others were resting on the wet banks of, or stones in, a turbulent little torrent where it cascaded through the shady forest.

Phrynobatrachus dendrobates (Boulenger)

Arthroleptis dendrobates Boulenger, 1919, Revue Zool. Afr. **7**, p. 8: Madié, i.e. Medje, Belgian Congo.

♂ (M. C. Z. 25438) Kibale Forest, U. 12. xii. 38.
5 (M. C. Z. 25439–41) Idjwi Id., B. C. ii. 39.

Variation. Tibio-tarsal articulation reaches nostril or end of snout. See also under *Phrynobatrachus.*

Size. Length ♂ 31 mm., and of Idjwi series both sexes 23–33 mm.

Enemies. In stomach of a tree snake (*Hapsidophrys lineata*) taken in Budongo Forest.

Habitat. On damp leaves of forest floor in Kibale Forest.

Phrynobatrachus versicolor Ahl.

Phrynobatrachus versicolor Ahl, 1924, Zool. Anz., **61**, p. 100: Rugege Forest, Belgian Ruanda-Urundi.

20 (M. C. Z. 25451–5) Nyakabande, U. 28. i. 39.
7 (M. C. Z. 25442–5) Mushongero, U. 1. ii. 39.
25 (M. C. Z. 25446–50) Idjwi Id., B. C. ii. 39.

Native name. *Miusi* (Lulega, but not specific).

Correction. Formerly I (1936h, p. 97) regarded this species as indistinguishable from *dendrobates*, with which I synonymized it. Now, after seeing them both in life, I believe them to be distinct though I

am at a loss to define *versicolor* except by stouter habit and pigmentation of lower surface, for in size, limb length, webbing, etc., they appear to be indistinguishable.

Variation. Tibio-tarsal articulation just fails to reach the eye in one frog, reaches eye or nostril in majority, end of snout in a very few instances. Minute spines are present on soles of hind feet in both sexes but are better developed in the males. See also under *Phrynobatrachus*.

Color. A narrow, light, vertebral band in two (Mushongero and Idjwi) frogs only, but flanks of three large females in the latter series are strikingly light, as if each side bore a broad, light band.

Size. Length of ♂♂ 25–28 mm., ♀♀ 25–34 mm., average for 52 frogs of both sexes 29.7 mm.

Habitat. This frog is doubtless associated with forest as is indicated by the type locality. I must state, however, that most of mine came from the deforested uplands in the Kigezi district.

Phrynobatrachus graueri (Nieden)

Arthroleptis graueri Nieden, 1910, Sitz. Ges. naturf. Freunde Berlin, p. 441: Rugege Forest, Belgian Ruanda-Urundi.

4 ♂	2 ♀	7 juv.	(M. C. Z. 25456–8) Budongo Forest, U.	23. xi. 38.
	2 ♀		(M. C. Z. 25459) Kibale Forest, U.	13. xii. 38.
1 ♂	1 ♀		(M. C. Z. 25460–1) Mubuku Valley, U.	31. xii. 38.
17 ♂	15 ♀	2 juv.	(M. C. Z. 25462–5) Mihunga Swamp, U.	18. i. 39.
5 ♂			(M. C. Z. 25466–9) Mushongero, U.	3. ii. 39.
11 ♂	4 ♀		(M. C. Z. 25470–3) Kisenyi, B. R.	11. ii. 39.
69 ♂	25 ♀	2 juv.	(M. C. Z. 25474–7) Idjwi Id., B. C.	16–28. ii. 39.

Native names. Senyamiganda (Lukiga for all ranids); *ntoli* (Lutoro); *etoli* (Lukonjo); *kashakara* (Lulega, but for *Arthroleptis* also).

Remarks. In the field, more especially at Mihunga and on Idjwi, I was under the impression that I was dealing with two species, in part owing to the fact that gravid females from 25–31 mm. seemed a large range. In the laboratory I have failed to find any means of separating two forms or species, for they occurred together.

Variation. Tibio-tarsal articulation reaches eye or nostril, rarely to end of snout; this range is covered by *both* sexes though in general females average a relatively shorter hind limb. See also under *Phrynobatrachus*.

Color. In life. ♂. Mihunga. Above, dark olive, from nostril to eye an indistinct brown streak, a broad and conspicuous one from eye, through tympanum, to forelimb; from snout to anus a very fine, yel-

low, vertebral line; a black circum-anal area is flanked by a pair of light lines; limbs barred with brown, thighs with light bars also, tibia with a fine light longitudinal line. Below, throat black, posteriorly minutely flecked with white; breast and limbs infuscated with brown; hind limbs, from the waist, often chrome colored.

In life. ♀. Mihunga. Above, brown or olive though sometimes quite green, snout paler; a dark interorbital band; a dark, light-edged, circum-anal area; limbs indistinctly barred with brown; digits barred with white and brown. Below, white, the throat infuscated with brown, the belly often bluish and almost spotted with brown; soles brown.

A broad, light, vertebral line in 1 ♂ from Mubuku, 1 ♂ from Mushongero, 1 ♂ and 1 ♀ from Mihunga, 16 ♂♂ and 8 ♀♀ from Idjwi; 1 Mushongero and 2 Mihunga males have the dorsal area between the glandular cordons light brown edged with black along the cordons, thus presenting a very distinctive appearance.

Size. Length of 108 ♂♂ 20–24 mm., average 21.8 mm., of 46 ♀♀ 24–31 mm., average 26.3 mm., of 11 young 9–14 mm.

Breeding. On January 18, males, recognizable by their dark and granular throats, were heard calling "tink-tink" in the swamp at the foot of the Weria Ravine; on February 3 they were noted as "clicking" in pools close to the papyrus fringing the edge of Lake Mutanda. Females were gravid during the entire three months of our stay in the Central Lake Region which coincided with heavy rains.

Enemies. In stomach of a tree snake (*Dipsodoboa unicolor*) in Mihunga Swamp.

Habitat. On damp leaves beside streams in the forests of Budongo, Kibale, and the Mubuku Valley, while at Mihunga they were calling from the water-filled footprints of elephants among the long grass of the swamp. At Mushongero and Kisenyi there was no real forest in the vicinity though much of this region has suffered from deforestation.

ARTHROLEPTIS MINUTUS Boulenger

Arthroleptis minutus Boulenger, 1895, Proc. Zool. Soc. London, p. 539, pl. xxx, fig. 4: Durro, Western Somaliland, *i.e.* Duro, Ethiopia.

25 (M. C. Z. 25408–9) S. Kinangop Plateau. K. C. 27. x. 38.
2 (M. C. Z. 25410–1) Mikindani, T. T. 12. iv. 39.
1 (M. C. Z. 25412) Lindi, T. T. 1. vi. 39.

Variation. Tips of fingers not dilated; metatarsal tubercles and a

tarsal tubercle present, small; tibio-tarsal articulation reaches eye or just beyond.

Color. The Mikindani males differ from the Kinangop breeding males by the possession of very black throats.

Size. Length (sexing questionable as based on external appearance) ♂♂ 18–20 mm., average 19 mm., ♀♀ 21–24 mm., average 21 mm., only one frog over 22 mm.

Breeding. On October 27 the Kinangop frogs were assembling for breeding, the small rains having just commenced. Probably the two Mikindani males also, the big rains being in full force. The only juvenile taken during the entire eight months was captured on June 1 under grass thatching, it measured 12.5 mm.

Parasites. The buttocks of the Mt. Kinangop series are infested with chigger mites (*Endotrombicula* sp.) possibly of the same species (*penetrans*) which I found in *minutus* from Mt. Sagalla.

Habitat. Many of those taken on the Plateau at 10,000 feet were *clambering* about in the long dew-drenched grass flanking the Chania River, it seems difficult to believe that they are specifically identical with those taken in the coastal belt under 100 feet alt.

Arthroleptis xenodactylus Boulenger

Arthroleptis xenodactylus Boulenger, 1909, Ann. Mag. Nat. Hist. (8), **4**, p. 496: Amani, Usambara Mountains, Tanganyika Territory.

Arthroleptis schubotzi Nieden, 1910, Sitz. Ges. naturf. Freunde Berlin, p. 440: Usumbura, Belgian Ruanda-Urundi.

1 (M. C. Z. 25403) Mikindani, T. T. 12. iv. 39.
2 (M. C. Z. 25404–5) Nchingidi, T. T. 12. v. 39.
5 (M. C. Z. 25406–7) Magrotto Mtn., T. T. 8–12. vii. 39.

Synonymy. Apart from our big series of topotypes, we have this species from right across Tanganyika Territory to the Lake itself, as well as from Buta, Bas Uele, Belgian Congo, determined by Dr. G. F. de Witte, with whose identification I concur. There seems, therefore, no reason to regard *schubotzi* as distinct, the frogs referred by me (1933h, p. 380) to that species are much smaller and therefore described below as new.

Variation. Tips of fingers more or less swollen, of toes distinctly dilated into little disks; metatarsal tubercle small, oval, no outer or tarsal tubercles; tibio-tarsal articulation reaches tympanum or eye (posteriorly in ♀, anteriorly in ♂♂).

Color. In life. ♂. Magrotto. Above, pale fawn; a few light flecks on buccal border and a larger, slightly pink, spot posterior to commissure of mouth; a dark brown interocular patch continuous with hourglass pattern on back; from upper eyelid a light, dorsolateral, glandular line and immediately below it, on flanks, scattered dark brown patches; groin transparent red; limbs and feet pale fawn barred or mottled with dark brown. Below, whitish, chin and throat flecked with gray; center of belly pale yellow.

Another ♂. Magrotto. Above, back, upper arm and tibia vermilion red, remaining upper parts grayish olive; flanks flecked with white. Below, grayish, indistinctly flecked with white.

Size. Length ♂♂ 19–20 mm., ♀♀ 20–22 mm., young 14–15 mm.

Breeding. On April 12 female gravid, distended with ova; on May 12 two young.

Enemies. One in stomach of a snake (*Neusterophis o. uluguruensis*).

Habitat. The Nchingidi juveniles were taken on a forest path and beneath a log, the Magrotto adults in swamp by camp and near sawpit at forest edge, immediately after heavy rain.

ARTHROLEPTIS XENODACTYLOIDES NKUKAE subspec. nov.

Arthroleptis schubotzi Loveridge (not of Nieden), 1933, Bull. Mus. Comp. Zoöl., **74**, p. 380.

Type. Museum of Comparative Zoölogy, No. 17029, an adult ♀ from Nkuka Forest, Rungwe Mountains, Tanganyika Territory, collected by Arthur Loveridge, March 1930.

Paratypes. Museum of Comparative Zoölogy, Nos. 17026–8 and 17030–53, being the entire series of material listed in the above citation taken in the Rungwe, Ukinga and Uzungwe Mountains of southwestern Tanganyika Territory.

Remarks. In 1933, though with serious misgivings, I referred these frogs to *schubotzi* Nieden rather than describe three new species of *Arthroleptis* from the Rungwe-Ukinga region at the northern end of Lake Nyasa. Subsequent information, however, has led me to conclude that *schubotzi*, whose type measured 21 mm., is a synonym of *xenodactylus* Boulenger, whereas the Nkuka material is but a form of the smaller *xenodactyloides* Hewitt, whose type was 19 mm.

Diagnosis. *A. xenodactyloides* Hewitt (1933) was described from Chirinda Forest, Mount Selinda, Southern Rhodesia, a thousand miles south of the Nkuka Forest. The new race differs from the typical

form, of which we have extensive topotypical material, in that the belly of adult *nkukae* is darkly marmorate whereas in *xenodactyloides* it is immaculate.

Color. In life. This, together with much information about breeding, diet, parasites, habitat, etc. will be found in the citation given above.

Size. Length of Type ♀ from snout to anus, 17 mm., but the largest of several hundred specimens from the Nkuka Forest, Kigogo, and Madehani, all measure 18 mm.

Arthroleptis xenochirus Boulenger

Arthroleptis xenochirus Boulenger, 1905, Ann. Mag. Nat. Hist. (7), **16**, p. 108, pl. iv, figs. 2–2a: Marimba, northern Angola.

♂ (M. C. Z. 25413) Idjwi Id., B. C. ii. 1939.

Native name. Kashakara (Lulega). The Balega, when questioned, appeared not to have any special name for this peculiar little frog.

Remarks. A. xenochirus is known only from the ♂ holotype and Nieden's (1908) record of one from Jaunde, Cameroon, presuming that this is the same frog as that listed by Deckert (1938).

Idjwi Island, in Lake Kivu, lies just under a thousand miles northeast of Marimba, yet our frog differs in only one particular from the description; being formalin preserved, however, the color pattern description cannot be checked.

Boulenger states that the third finger of the type is three times the length of the second, this tallies with the proportions shown in his fig. 2, but in the enlargement of the hand, fig. 2a, it is three and two-third times. The length of the type was 19 mm.

In the 22 mm. holotype of *A. proctrae* Witte (1921) from Beni, 200 miles northwest of Idjwi, the third finger is only 2 times as long as the second. This frog was said to differ from *xenochirus* in that the tibiotarsal articulation reached the eye (instead of tympanum), the first finger was as long as (instead of shorter than) the second. The latter alleged difference, judging by the figures, is based on a difference of interpretation; the former is trifling and well within the range of variation displayed by most members of the genus.

In the Idjwi frog the third finger is *four times longer than the second*, but in the absence of comparative material I refrain from describing an eastern race based on a single specimen which is the same length as the type of *xenochirus*.

Size. Length 19 mm., length of third finger 9 mm.

ARTHROLEPTIS near POECILONOTUS Peters

Arthroleptis poecilonotus (Schlegel) Peters, 1863, Monatsb. Akad. Wiss. Berlin, p. 446: Boutry, Ashanti, Gold Coast.

1 (M. C. Z. 25402) Mabira Forest, U. 10. xi. 38.

Remarks. The state of preservation leaves much to be desired and a series is badly needed, I scarcely think that it is referable to *poecilonotus* which has never been recorded from Uganda.

Variation. Tips of digits slightly swollen or dilated (but no longer so), first finger slightly shorter than second; a metatarsal, but no tarsal, tubercle, small, rounded, shorter than inner toe, appears rather less prominent than in *poecilonotus;* toes with a rudiment of web; tibiotarsal articulation reaches nostril.

Color. In alcohol. Above, grayish mottled with brown rather like *minutus* from which it differs in lacking a second tubercle, etc.

Size. Length 20 mm.

Habitat. At base of banana plant in a plantation across the ravine from the Mubango rubber-coffee factory.

ARTHROLEPTIS ADOLFIFRIEDERICI Nieden

Arthroleptis adolfi-friederici Nieden, 1910, Sitz. Ges. naturf. Freunde Berlin, p. 440: Rugege Forest, Belgian Ruanda-Urundi.

Arthroleptis affinis Ahl, 1939, Sitz. Ges. naturf. Freunde Berlin, p. 303, fig. 1: Amani, Tanganyika Territory (Type ♀ 39 mm.).

Arthroleptis schoenebecki Ahl, 1939, Sitz. Ges. naturf. Freunde Berlin, p. 305, fig. 2: Amani, Tanganyika Territory (Type ♂ 22 mm.).

3 (M. C. Z. 25400–1) Magrotto Mtn., T. T. 3. vii. 39.

Synonymy. Magrotto Mountain is but twenty miles distant from Amani, Usambara Mountains, type locality of *affinis* and *schoenebecki.* The Museum of Comparative Zoölogy possesses 190 Amani topotypes which were referred by Barbour & Loveridge (1928, p. 212) to *adolfifriederici.* Though I have never examined the type of that species, I see no reason to question the identification for the M. C. Z. possesses an example (M. C. Z. 14696) from just north of Lake Kivu—and so nearly topotypical—as well as others from intermediate localities in the Poroto and Uluguru Mountains, as well as from Mt. Mbololo in Kenya.

Ahl compares *affinis* with *methneri* Ahl from near Kilwa, a species

I regard as synonymous with *A. s. stenodactylus* though comparison may show it to be a synonym of *A. s. lönnbergi* seeing that the latter has turned up on the Rondo Plateau to the south of Kilwa where it occurs alongside *Spelaeophryne methneri* Ahl.

Variation. Tips of toes, and of some fingers, distinctly dilated; metatarsal tubercle only moderately large, somewhat oval; tibiotarsal articulation reaches nostril or between eye and nostril.

Size. Lengths 34–39 mm.

Enemies. One in stomach of a young house snake (*Boaedon l. lineatus*).

Habitat. One beneath a log in the forest.

Arthroleptis stenodactylus lönnbergi Nieden

Arthroleptis lönnbergi Nieden, 1915, Mitt. Zool. Mus. Berlin, **7**, p. 361: Mombo, foot of Usambara Mountains, Tanganyika Territory.

Arthroleptis vagus Ahl, 1939, Sitz. Ges. naturf. Freunde Berlin, p. 306: Usambara Mountains, Tanganyika Territory (♂ 31 mm., ♀ 38 mm.).

Arthroleptis ukamiensis Ahl, 1939, Sitz. Ges. naturf. Freunde Berlin, p. 308, fig. 3: Ukami, Tanganyika Territory (♀ 33 mm.).

1 (M. C. Z. 25399) Nchingidi, T. T. 12. v. 39.

Synonymy. Nchingidi, on the Rondo Plateau, lies close to the Makonde Plateau which, together with Tendaguru and Amani, are among the localities of Ahl's paratypes of *vagus*. It is fortunate that Ahl definitely designated certain specimens as ♂ and ♀ cotypes in case the paratype from Chifumbazi, Mozambique, might prove referable to the typical form. The Museum of Comparative Zoölogy possesses a good series of *lönnbergi* from Amani, therefore topotypes of *vagus*.

Ukami, *i.e.* country of the Kami tribe, is practically synonymous with the Uluguru Mountains where they dwell. When I first noticed the difference between the two forms of *stenodactylus*, I submitted an Uluguru specimen to Ahl for favour of comparison with the type of *lönnbergi* which I thought it to represent. On account of Ahl's statement that they differed, I (1932) described *A. s. uluguruensis* which later (1936), on obtaining a topotype of *lönnbergi* from the original series, referred to the synonymy of the latter. To that synonymy I now add both *vagus* and *ukamiensis*.

Variation. Tips of fingers slightly swollen, of second, third, and

fourth toes dilated; metatarsal tubercle large, shovel-shaped; tibio-tarsal articulation reaches tympanum.

Size. Length 30 mm.

Enemies. One recovered from stomach of a green snake (*Chlorophis macrops*) and three from white-lipped snakes (*Crotaphopeltis h. hotamboeia*) at Nchingidi.

Arthroleptis stenodactylus stenodactylus Pfeffer

Arthroleptis stenodactylus Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., **10**, p. 93, pl. i, fig. 11: Kihengo, Tanganyika Territory.

2 (M. C. Z. 25383–4) Kitaya, T. T. 30. iii. 39.
21 (M. C. Z. 25385–9) Mikindani, T. T. 11. iv. 39.
2 (M. C. Z. 25390–1) Mbanja, T. T. 27. iv. 39.
2 (M. C. Z. 25392–3) Lindi, T. T. 1. vi. 39.
3 (M. C. Z. 25394–5) Magrotto Mtn., T. T. 1. vii. 39.
3 (M. C. Z. 25396–8) Likoni, K. C. 25. vii. 39.

Variation. Tips of digits not dilated; metatarsal tubercle, large, shovel-shaped; tibio-tarsal articulation reaches, or just fails to reach, tympanum except in 3 Mikindani, 2 Magrotto, and 1 Likoni frog where it attains the eye. The Magrotto frogs are somewhat intermediate between *s. stenodactylus* and *s. lönnbergi*, one would have expected them to be the latter.

Color. In life. Kitaya. Above, buff, so thickly speckled with red as to appear rufous; a large blotch beneath orbit and an interorbital mark on crown; from end of snout a dark band passes upwards over nostril, through orbit, above tympanum to flank where it breaks up into spots; groin and thigh gray, the latter indistinctly barred; tibia with four dark cross-bars. Below, pure white; soles of feet dusky gray.

Mikindani. A most unusual variant is a 25 mm. frog (M. C. Z. 25385) which has a broad, black-edged, light, vertebral streak from snout to anus.

Size. Length 18–38 mm., average 28 mm.

Breeding. Apparently not; the only specimen under 20 mm. in length was taken on July 25.

Diet. Ants and beetles.

Enemies. In stomachs of many snakes, viz. *Boaedon l. lineatus*, *Chlorophis neglectus* (2), *Crotaphopeltis h. hotamboeia*, and *Psammophis s. sudanensis* (2).

Habitat. Under rubbish at Kitaya; beneath rotting palm trunks and piles of coconut husks, also in swamped grasslands under palms, at Mikindani; under piles of grass at both Kitaya and Lindi; beneath *mcuti* at Likoni.

Cacosternum boettgeri boettgeri (Boulenger)

Arthroleptis boettgeri Boulenger, 1882, Cat. Batr. Sal. Brit. Mus., p. 118, pl. xi, fig. 8: Vleis, Kaffraria, Bechuanaland.

7 (M. C. Z. 25478–9) S. Kinangop Plateau, K. C. 29. x. 38.

Remarks. It is with some hesitation that trinomials are employed for the status of *C. b. albiventris* Hewitt, 1926, is not too clear. A pair (M. C. Z. 15807, 22260) received from Power, the first to recognise it, seem scarcely distinguishable. The only other writer to consider the form as valid is Hoffman, 1940, who obtained a single example at Broedershoek, near Greytown, Natal.

Variation. Tympanum concealed; tips of digits not dilated; a distinct inner, and a scarcely distinguishable outer, metatarsal tubercle; no tarsal tubercle; tibio-tarsal articulation reaches shoulder.

Size. Length ♂♂ 18–20 mm., ♀ 22 mm.

Breeding. These males, standing vertically in rain-formed pools with their forelimbs resting on grass blades beneath overhanging tussocks, were calling loudly, but difficult to locate on account of the concealed positions which they had selected.

Hemisus marmoratum marmoratum (Peters)

Engystoma marmoratum Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 628: Cabaçeira, Mozambique.

4 (M. C. Z. 25480–2) Kitaya, T. T. 30. iii. 39.
9 (M. C. Z. 25483–5) Mikindani, T. T. 15. iv. 39.
5 (M. C. Z. 25486–7) Lindi, T. T. 1. vi. 39.
9 (M. C. Z. 25488–9) Siga Caves, T. T. 15. vi. 39.

Native names. Kisianene (Kiyao); *chihenene* (Kimakonde); *chenene* (Kimwika). These names being applied also to *Breviceps mossambicus.*

Color. In life. Kitaya. ♀. Above, gray, or greenish gray, vermiculated with black; sides paler. Below, white, uniform.

Size. Length 22–33 mm., those of 22–23 mm. still bearing stumpy rudiments of tails.

Breeding. On June 15 only, were young examples found, the entire Siga series ranging from 22–26 mm.

Enemies. Two tailed young recovered from the stomach of an egret (*Egretta g. dimorpha*) at Siga, an adult from a house snake (*Boaedon l. lineatus*) at Mikindani.

Habitat. Three beneath thatching of a collapsed hut at Kitaya; under rubbish or in damp sand beneath mango trees at Mikindani; beneath bundles of grass at Lindi; under palm fronds at Siga Caves. When uncovered these plump little frogs squat down, then run fast rather like a mouse.

BREVICIPITIDAE

Callulina kreffti Nieden

Callulina kreffti Nieden, 1910, Sitz. Ges. naturf. Freunde Berlin, **10**, p. 449: Amani, Usambara Mountains, and Tanga, Tanganyika Territory.

13 (M. C. Z. 25490–4) Magrotto Mtn., T. T. 6. vii. 39.

Native name. Kikorowe (Kisambara, but applied to *Probreviceps* also).

Color. In life. Above, pale brown mottled with sepia in adults, the young are often particolored the head and posterior half of back being dark brown edged with black, the anterior half of back from shoulder to about midbody, and a spot on the lumbar region, creamy white. Below, adults white, or pale chrome, minutely flecked with chinese white; young dark gray, almost black, minutely flecked with chinese white. The pupil of a toad with a bright pale chrome throat was horizontal, black with bright orange iris, in all the others it was pale bronze.

Size. Length 22–45 mm., average 32 mm., for only four were really young 22–24 mm. at this time.

Defence. On being removed from their retreats these toads immediately inflate tremendously and, rising stiffly on their ridiculously short little legs, present a very *Breviceps*-like appearance. Simultaneously their pores exude an extremely sticky substance which was very difficult to remove from one's fingers except with blue-wattle soap which has a high soda content.

To ascertain whether this exudation possessed the same poisonous properties as that of *Phrynomerus bifasciatus*, I purposely rubbed my sticky fingers together. Apart from a slight tingling or pulsating sensation, however, no serious ill-effects were noticeable.

Habitat. The entire series were taken at Kitulwe, nine resulted from the examination of fifty wild bananas which were systematically searched. It was observed that the toads were almost all in the basal portion of the outermost leaf-stalks, which are so often in a semi-withered condition.

SPELAEOPHRYNE METHNERI Ahl

Spelaeophryne methneri Ahl, 1924, Zool. Anz., **61**, p. 99: Nangoma Cave, Matumbi near Kilwa, Tanganyika Territory.

19 (M. C. Z. 25495–500) Nchingidi, T. T. 11–19. v. 39.

Range. The finding of this rare and interesting species on the Rondo Plateau, which lies just a hundred miles south of the type locality, is principally of interest as furnishing further proof of the similarity of the plateau forest fauna with that of the Uluguru Mountains, the only other place from which *methneri* has been recorded.

Size. Length 25–50 mm., average 37.9 mm.

Habitat. The entire series were collected by my boys and me from beneath logs in the forest or along the forest-edge, the ground being kept moist by frequent downpours. In some cases colonies of termites were located under the same logs as those sheltering these black and scarlet toads.

PROBREVICEPS MACRODACTYLUS MACRODACTYLUS (Nieden)

Breviceps macrodactylus Nieden, 1926, Das Tierreich, **49**, Anura, **2**, p. 6: Usambara Mountains, Tanganyika Territory.

4 (M. C. Z. 25501–4) Magrotto Mtn., T. T. 28. vi. 39.

Native name. Kikorowe (Kisambara, but applied also to *Callulina*).

Range. Magrotto is but twenty miles from the type locality.

Size. Length ♂♂ 40–40 mm., ♀ 58 mm.

BREVICEPS MOSSAMBICUS Peters

Breviceps mossambicus Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 628: Mozambique Island, and Sena, Mozambique.

9 (M. C. Z. 25505–9) Mikindani, T. T. 18. iv. 39.
7 (M. C. Z. 25510–4) Nchingidi, T. T. 11. v. 39.

Native names. Neither the Makonde nor Mawiha distinguish this species from *Hemisus m. mormoratum*, which see.

Size. Length 20–47 mm., average 29 mm.

Enemies. On two occasions recovered from the stomachs of bird snakes (*Thelotornis k. capensis*).

Habitat. The Mikindani series were obtained by turning over piles of rubbish, often gathered by rainstorms, in the red roadside ditches.

Hoplophryne rogersi Barbour & Loveridge

Hoplophryne rogersi Barbour & Loveridge, 1928, Mem. Mus. Comp. Zoöl., **50**, p. 258, pl. ii, fig. 5: Mount Bomoli, near Amani, Usambara Mountains, Tanganyika Territory.

5 (M. C. Z. 25515–9) Magrotto Mtn., T. T. 3–6. vii. 39.

Range. Heretofore known only from the type locality which is about twenty miles from Magrotto.

Color. In life. Pupil black, roundish.

Size. Length ♂♂ 25–27 mm., ♀♀ 22–25 mm.

Habitat. The first pair, the male of which had lost a foot, were found beneath logs beside a sawpit in a section of forest where there were neither wild bananas nor bamboos in which they could breed! Two days later I searched through the bamboos growing beside the stream which one crosses on entering Magrotto Plantation from Muheza, but found only one pair and these beneath a rotted log lying among the bamboos. The only wild bananas said to be surviving on the mountain are those at Kitulwe which I visited on July 6, a search of fifty wild bananas, however, resulted only in the capture of a single male!

PHRYNOMERIDAE

Phrynomerus bifasciatus (Smith)

Brachymerus bifasciatus A. Smith, 1849, Ill. Zool. S. Africa, Rept., pl. lxiii: "Country to the east and northeast of Cape Colony."

35 (M. C. Z. 25520–5) Lindi, T. T. 31. v. 39.

Size. Length 25–49 mm., average 31.8 mm.

Habitat. The majority of these halfgrown toads were taken beneath the thatching of some collapsed huts on the edge of a swampy area in process of dessicating.

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EXPLANATION OF PLATES

PLATE 1

Map showing Principal Collecting Localities

1938

Landing at Mombasa (25.x), except for a stopover at Naivasha and Kinangop (26–31.x), Loveridge proceeded by rail direct to Jinja (1–5.xi). Thence to Mabira Forest (5–21.xi), Budongo Forest (22.xi–7.xii), Kibale Forest (8–19.xii), Bundibugyo near Bwamba Forest (19–26.xii), Bugoye, foot of Ruwenzori Mountains (26–28.xii) and Mubuku Valley at 7000 ft. (29.xii–).

1939

On leaving Mubuku (–9.i) Loveridge descended down the valley to Mihunga, *circa* 6000 ft. (9–21.i) then back to Bugoye (21–24.i), Nyakabande (25–30.i), Mushongero (30.i–4.ii), returned to Nyakabande (4–8.ii), Kisenyi (8–13.ii), Goma (13–14.ii), Mamvu on Idjwi Island (14–16.ii), Upper Mulinga River on Idjwi (16.ii–6.iii), Uvira (7–8.iii), Ujiji (9–16.iii), Dar es Salaam (18–19.iii), Mikindani (22–24.iii), Kitaya (24.iii–7.iv), Mikindani (7–24.iv), Mbanja (25.iv–6.v), Lake Rutamba (6–8.v), Nchingidi (9–21.v), Lindi (22.v–4.vi),Siga Caves (7–17.vi), Amboni Estate (17–27.vi), Magrotto Mountain (27.vi–21.vii), Tanga (21–23.vii), Likoni opposite Kilindini (24–26.vii).

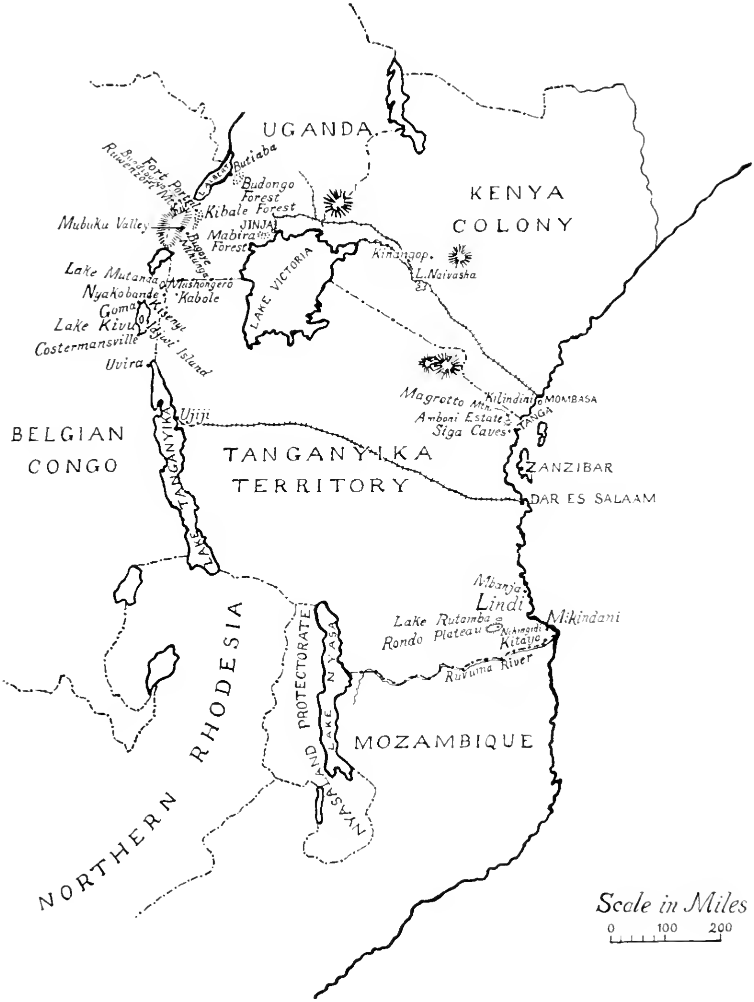
UGANDA
KENYA
COLONY
Butiaba
Budongo
Forest
Fort Portal
Ruwenzori Mts.
Kibale Forest
JINJA
Mubuku Valley
Mabira
Forest
LAKE VICTORIA
Kinangop.
L. Naivasha
Lake Mutanda
Mushongero
Nyakobande
Kabole
Goma
Kisenyi
Lake Kivu
Costermansville
Idjwi Island
Uvira
Magrotto Mtn.
Kilindini
MOMBASA
Amboni Estate
Siga Caves
TANGA
Ujiji
BELGIAN
CONGO
LAKE TANGANYIKA
TANGANYIKA
TERRITORY
ZANZIBAR
DAR ES SALAAM
Mbanja
Lindi
Mikindani
Lake Rutamba
Rondo Plateau
Kitaya
Ruvuma River
NORTHERN RHODESIA
NYASALAND PROTECTORATE
LAKE NYASA
MOZAMBIQUE
Scale in Miles
0
100
200

PLATE **2**

PLATE 2

Age Dichromatism in Frogs of the Genus *Leptopelis*

Fig. 1. *L. notatus christyi* (Boulengèr) young

One (M. C. Z. 25118) of several young frogs which I found on a forest trail—apparently dislodged by heavy rain from the canopy—or seated on the leaves of freshly-felled trees in the Kibale Forest.

Fig. 2. *L. notatus christyi* (Boulenger) adult

This topotypic ♀ (M. C. Z. 25114), gravid on November 7, was found beneath loose bark on the trunk of a tree growing in the garden of the late Major C. C. Christy's house at Mubango, in the vast Mabira Forest, Chagwe.

Fig. 3. *L. johnstoni* (Boulenger) adult

A 68 mm. gravid ♀ (M. C. Z. 25125) was one of a series of these tree frogs taken on Magrotto Mountain, July 7. The males are sometimes green, and many half-grown green specimens were taken as they squatted on broad-leaved plants in a forest clearing.

Fig. 4. *L. johnstoni* (Boulenger) young

I netted this froglet (M. C. Z. 25135), measuring 18 + 25 mm., in the swamp immediately below my camp on Magrotto Mountain. *En route* to the swamp I had brushed against a luxurious growth of ferns projecting from the stem of an oil palm, and shortly afterwards discovered a 48 mm. *johnstoni* squatting on my sleeve!

Fig. 5. *L. concolor* Ahl. adult

The frog (M. C. Z. 20563), one of a series taken at Malindi on the coast of Kenya during the course of a former expedition, was selected because a detailed description of its color in life was available. Malindi lies just south of the type locality which I visited during the breeding season when the males, their vocal sacs inflated to great white bubbles, were calling on every side.

Fig. 6. *L. concolor* Ahl. young

This frog (M. C. Z. 25124) was one of three recovered from the stomach of a spotted wood snake in the vicinity of Siga Caves. Two of the frogs were too macerated to be worth preserving, and the preservation of the figured specimen leaves much to be desired. Its morphological characters appear to be those of *concolor*, but its coloration raises doubts as to whether it may not be a young *johnstoni*, for slightly smaller *concolor*, taken at Mikindani, are uniformly green.


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PLATE **3**

PLATE 3

Sexual Dichromatism in Frogs of the Genus *Hyperolius*

Fig. 1. *H. ahli* Loveridge. ♂ Type

While the type was green, other males varied from a paler green through straw to flesh color. Apparently these frogs remain under water during the day, for only one was seen during half-an-hour spent wading among the lily pads. Continuing over the same area immediately after sunset, however, sent more than a dozen leaping away.

Fig. 2. *H. ahli* Loveridge. ♀ Paratype

Though the spots of the figured female were pure white, those of others were pale flesh color and, at Kitaya, were pale red.

Fig. 3. *H. p. parkeri* Loveridge. ♂ Paratype

The type series of this species came from near Bagamoyo where their ringing calls, like a clear "pop-pop", came from a swamp bordering the Ngerengere Road. The sedges, on which they were found squatting, were so sharp that it was next to impossible for my bare-legged assistants to wade among them.

Fig. 4. *H. p. parkeri* Loveridge. ♀ Type

The females deposited their white eggs, ranging from 69 to 110 in number, on these sedges at a point just above the water level so that, provided the rains continued as heavy as they had begun, the spawn would be submerged within the course of a day or two.

Fig. 5. *H. p. rovumae* Loveridge. ♂ Paratype

The males of this slightly larger southern form differ also in bearing black breeding spinosities on the belly as well as on the thighs and feet. In *H. p. parkeri*, on the other hand, such spinosities are confined to the feet.

Fig. 6. *H. p. rovumae* Loveridge. ♀ Type

At Kitaya these females were assembling to spawn in early April. Apart from color differences, such females were readily recognizable from the ova being clearly visible through the delicate and transparent skin of the abdomen

Fig. 7. *H. milnei* Loveridge. ♂ Paratype

Even by day these diminutive frogs may be found squatting on grass and lily pads, at night their numbers are augmented by others coming out of the water. Be it day or night they are constantly on the alert, leaping, diving, or swimming away before one can come within netting distance of them.

Fig. 8. *H. milnei* Loveridge. ♀ Type = *H. pusillus* (Cope)

Despite the type localities of *milnei* (Kenya Colony) and *pusillus* (Natal) being nearly 2500 miles apart, I believe that they should be regarded as one species. It is true that *milnei* is usually more spotted, but there is much variability and if a northern form is to be recognized then *microps* would have precedence over *milnei*.


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PLATE 4

PLATE 4

African Frogs of arboreal, aquatic, and terrestrial habits.

Fig. 1. *Leptopelis notatus christyi* (Boulenger)

A green, gravid, 46 mm. female found squatting on a green sedge in Mihunga Swamp, Ruwenzori Mountains. Its color, in marked contrast to that of a brown, gravid, 48 mm. female found clambering over fallen sedges that had been cut down earlier in the day.

Fig. 2. *Kassina senegalensis* (Duméril & Bibron)

A gravid, 44 mm. female found hiding beneath a log on Idjwi Island, Lake Kivu. Of the many examples of this species, which should be arboreal, that I have encountered, not one was found off the ground. When the rains break they emerge from their places of concealment and assemble at the pools, at such a time their ringing calls, like the sound of bursting bubbles of water, may be heard a mile away.

Fig. 3. *Rana albolabris albolabris* Hallowell

In contrast to the subject of Fig. 2, the white-lipped frog, though belonging to a genus whose members are terrestrial, fossorial, or aquatic, has developed slight digital expansions and taken to living in trees or, as on Idjwi Island, in bananas.

Fig. 4. *Rana occipitalis* Günther

In habits this five-inch bullfrog is probably the most aquatic African member of the genus. Like *R. edulis* it is also cannabalistic for, in addition to a large Dytiscid beetle, the stomach of one of these Ujiji specimens held the bones of a small frog. Apparently, however, they do not indulge in scorpions, centipedes, biting ants, and other poisonous creatures which make a meal interesting for *edulis*.

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THE AMERICAN CAECILIANS

By Emmett Reid Dunn

CAMBRIDGE, MASS., U.S.A.
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AT HARVARD COLLEGE

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No. 6.—*The American Caecilians*[1]

By Emmett Reid Dunn

An interest in American Caecilians, begun in 1920 when I found a few specimens of Gymnopis in Costa Rica, was enhanced when I took a specimen of a new species in western Panamá in 1923. In 1928 I attempted, rather unsuccessfully, to list the North American forms. In Europe in 1929, as a holder of a John Simon Guggenheim Memorial Fellowship, I took the opportunity to examine the American Caecilians in the collection of the British Museum of Natural History and in the principal museums of the continent. Since my return I have examined practically all the material in the United States, in Panamá, and in Costa Rica, and have been sent extensive collections by the Instituto La Salle in Bogotá, by the Museu Paulista in São Paulo, and by the Museu Nacional in Rio de Janeiro.

Systematic treatment of American Caecilians since 1895 has been based almost entirely upon the work of Boulenger and upon the collections of the British Museum. This institution contained, in 1929, 103 American Caecilians (28 species, 6 genera, and the types of 15 described forms). While it is the best single collection, it is far from complete.

My present treatment is based on the examination of 850 American Caecilians (44 species, 6 genera, the types of 39 described forms, and the types of nine forms thought to be new). I have not been able to examine the types of 14 described forms. I consider one of these valid and can place it in its genus. I suspect that another may be valid but as I cannot place it in any known genus it must remain *incerta sedis*. I therefore recognize 6 genera, and 44 species, of which I have seen specimens of all but one species.

genus	specimens	types seen	types not seen	species
Rhinatrema	19	3 + 2 new	1	6
Gymnopis	157	11	2	11
Siphonops	253	4	5	5
Caecilia	324	15 + 7 new	2	16
Chthonerpeton	39	2	1	3
Typhlonectes	58	4	2	3
	850	39 + 9 new	13	44

The type of *Siphonops syntremus* Cope is another I have not been able to examine, but I cannot place it in any known American genus or species.

[1] Contributions from the Biology Department, Haverford College, No. 8.

Distribution

American Caecilians range from latitude 20 north (Vera Cruz and Guerrero in Mexico) to latitude 35 south (Buenos Aires, Argentina) on the Atlantic side, and to latitude 3 south (Guayaquil, Ecuador) on the Pacific side. They range from sea level to 4500 feet (Cartago, Costa Rica) and to 6200 feet (Milligalli, Ecuador).

They occur on the following islands: Saboga and San Miguel in the Gulf of Panamá; Gorgona off the Pacific coast of Colombia; Trinidad; Victoria and São Sebastião off the coast of São Paulo, Brazil.

Mexico to Costa Rica inclusive have only the genus Gymnopis. Bolivia and Paraguay have only Siphonops. Argentina and Uruguay have only Chthonerpeton. Panamá has Gymnopis and Caecilia. Colombia has 5 genera and 18 species; Ecuador, 4 genera and 11 species; Peru, 4 genera and 8 species; the Guianas, 5 genera and 8 species; Brazil, 4 genera and 13 species.

Gymnopis and Siphonops form a pair of allied genera, the former northern, the latter southern. Typhlonectes and Chthonerpeton form another such pair of genera, the former northern, the latter southern.

Rhinatrema and Caecilia occupy the center of the group range, northwestern South America, which is also the area of greatest abundance of genera and species.

There would seem to be a minor center of development in the south (Chthonerpeton and Siphonops) and perhaps another in Central America (Gymnopis).

It may be inferred from the distribution that Caecilians have inhabited South America since preTertiary times, and that they have only entered North America since the midTertiary. Only two genera reach Panamá, only one reaches Costa Rica, and the northern limit is 15 degrees of latitude short of the southern limit.

Generic assignments and affinities

A primitive Caecilian should, theoretically, have the following characteristics:

1. A definite tail.
2. Secondaries all complete and equal in number to the primaries.
3. Two complete rings of scales to each segment, one for the primary and one for the secondary.
4. Inner mandibular tooth row well developed.
5. Teeth of any given row uniform in size.

6. Tentacular aperture close to eye.
7. Eye well developed and in an open orbit.
8. Body approximately cylindrical, short and fairly stout, without dorsal fin.
9. Anus not surrounded by a sucking disk.
10. Oviparous.
11. Aquatic larvae, gill slit open.
12. Jaw muscles not roofed by bony contact between parietal and squamosal.
13. Skull with more rather than fewer separate bones.

The specimens here assigned to the genus Rhinatrema agree in all respects with the above criteria. Specimens assigned to other genera differ more or less, and are presumably less primitive.

Specimens assigned to the genus Gymnopis have no tail; the secondaries are less in number than the primaries and are not all complete; scales are absent anteriorly; the inner mandibular tooth row is poorly developed or absent; the tentacular aperture may be some distance anterior to the eye; the eye is, in some species, invisible, and the orbit is sometimes roofed over by bone; they are viviparous and have no aquatic larval stage.

Specimens assigned to the genus Siphonops agree on the whole with Gymnopis but lack secondaries and scales completely; the animals are oviparous; but there is not known to be an aquatic larval stage. These are all the differences I can find between such species as *Gymnopis mexicanus* and *Siphonops annulatus*. A common ancestor for these two genera may be inferred to have existed, with the secondaries and scales of Gymnopis and the breeding habits of Siphonops, and thus closer to Rhinatrema than either of the two.

The species assigned to Chthonerpeton have no tail; they lack secondaries and scales entirely; the tentacular aperture is always some distance anterior to the eye and may be just behind the nostril; the anus is surrounded by a sucking disk; the animals are viviparous and the embryos have a single pair of large allantoic gills; it may be inferred that an aquatic larval stage is absent.

The species assigned to Typhlonectes agree on the whole with Chthonerpeton, but the tentacular aperture is always just behind the nostril; the body is flattened laterally, with a dorsal fin. These are all the differences I can find between such species as *Chthonerpeton indistinctum* and *Typhlonectes compressicauda*. Chthonerpeton may be inferred to be ancestral to Typhlonectes.

These two genera agree with Rhinatrema in having a well developed inner mandibular tooth row.

The species assigned to Caecilia have no tail; the secondaries are reduced in number and sometimes entirely absent; scalation is reduced or entirely absent; the inner mandibular tooth row is reduced or absent; the tentacular aperture is remote from the eye, being under the tip of the snout, below and somewhat posterior to the nostril; the eye may be invisible and the orbit roofed by bone; the body may be excessively attenuated; the animals may be inferred to be oviparous, with an aquatic larval stage.

There are thus the following groups of genera in America: Rhinatrema; Gymnopis and its ally Siphonops; Chthonerpeton and its derivative Typhlonectes; Caecilia. Of these four groups, Rhinatrema occupies an isolated and a primitive position. The other three exhibit characters which preclude any linear arrangements of them. It is not impossible that each has been derived independently from a more primitive common ancestor. There is nothing known to prevent this common ancestor from having the characters of Rhinatrema.

The species here assigned to Caecilia have been listed as three genera; Amphiumophis, Herpele, and Caecilia. The unique type specimen of *Amphiumophis* is a *Caecilia tentaculata*. The only differentiating character given for the genus was the absence of the inner mandibular tooth row, which is poorly developed in some Caecilia. The roofed orbit and invisible eye of *C. ochrocephala* and *C. polyzona* have caused their reference to Herpele, but the eye is frequently invisible in other species of Caecilia, and *ochrocephala* and *polyzona* are so similar to the other forms of Caecilia that I cannot but regard them as congeneric.

The species here assigned to Gymnopis are usually listed as two genera; Gymnopis and Dermophis. The only difference given is the roofed orbit and invisible eye of Gymnopis. The variability and uncertainty of this condition in *Gymnopis multiplicata oaxacae* and in *Gymnopis nicefori* make a generic division of the species impractical.

I gather from the literature that four genera and six species occur in Southeast Asia; one genus with six species in the Seychelles Islands; six genera and 17 species in tropical Africa.

The degree of affinity between Rhinatrema and the genera Ichthyophis and Uraeotyphlus of southeastern Asia remains to be determined. Statements in literature would seem to indicate a fairly close relationship.

Parker (1941, Ann. Mag. Nat. Hist. (11), 7 pp. 1-17), has shown

that African and Seychelles Islands forms, formerly referred to Dermophis [=Gymnopis of this paper] are not congeneric with American species.

The African *Herpele squalostoma*, the type of Herpele, is not congeneric with any American form, although two have been referred to Herpele from time to time. The American forms in question are Caecilia. Whether or not the Indian *"Herpele" fulleri* is congeneric with either remains to be determined.

As matters stand it is not safe to consider that any genus of American Caecilians has representatives in the Old World, or, indeed, that any genus of Caecilians occurs in more than one of the four areas (southeast Asia, Seychelles Islands, African tropics, American tropics) inhabited by these animals.

The eye

Normally and primitively the eye is in an open orbit and visible through the skin. At the opposite extreme the orbit may be closed over by bone, and the eye may be invisible. In some forms the orbit may be open but the eye may be concealed by the thickness or the opacity of the skin. It is also possible that the eye may remain visible externally even after the orbit is roofed by bone. In many forms, known only from a few rare or unique specimens which it is not possible to dissect, the exact condition of the eye is not yet known. It is therefore often impossible to say more than that the eye is or is not visible externally.

It is so visible in all Rhinatrema, Chthonerpeton, and Typhlonectes, and the orbit is not known to be roofed over in any of these.

In Siphonops the orbit is not known to be roofed over in any form, but the eye is invisible externally in half the *S. insulanus* seen. Of 21 *S. brasiliensis* seen the eye is very indistinct in one and invisible in four.

In Gymnopis the eye is invisible externally in all *unicolor*, *oligozona* and *multiplicata multiplicata* seen. The orbit is known to be roofed by bone in some specimens of *unicolor* and *multiplicata multiplicata*. In *nicefori* the eye is invisible in 4 specimens out of 6. In one of these four the orbit is not roofed by bone. In *multiplicata proxima* the eye is visible externally in a single specimen (of 38 examined), and in this one the orbit is open. The eye is visible in 13 out of 15 *multiplicata oaxacae*, but the condition of the orbit is not known. In other forms of Gymnopis the eye is always visible and the orbit is not known to be roofed over.

In Caecilia the eye is invisible externally in all known specimens of *ochrocephala*, *polyzona*, and *elongata*. The orbit is known to be roofed over in some *ochrocephala*. In the following species the eye is occasionally invisible externally; *gracilis*, one of 31; *dunni*, one of 19; *thompsoni*, one of 9; *tentaculata*, three of 26; *bassleri*, three of twelve. The orbit was open in the specimen of *gracilis*.

The eye is always visible in the other forms of Caecilia, and the orbit is not known to be roofed over in any of them.

Cranial characters

I have examined specimens of *Rhinatrema bi-color*, *Gymnopis mexicanus mexicanus* (2), *Gymnopis unicolor*, *Siphonops annulatus*, *Siphonops brasiliensis*, *Caecilia ochrocephala*, *Chthonerpeton indistinctum*, *Typhlonectes compressicauda natans*, *Typhlonectes kaupii*.

The cranial characters confirm the position of Rhinatrema as primitive; the alliance between Gymnopis and Siphonops; the alliance between Chthonerpeton and Typhlonectes.

Rhinatrema bicolor has the premaxillae separate from the nasals. In the other genera the premaxilla and nasal are fused. *Rhinatrema bicolor* has a large flat bone posterior to the combined maxilla-palatine. What is obviously the same bone (but smaller) can be found in Gymnopis and in Siphonops. No such bone exists in Caecilia, Chthonerpeton, or Typhlonectes. This bone has the relationships of an ectopterygoid more than that of a pterygoid. In the literature it has gone by both names. I think that some Caecilians have an ectopterygoid, thus differing from all other living Amphibians, and that no Caecilians have a pterygoid. There has been much confusion in literature, because a forward extension of the quadrate (coössified in cartilage) has been called a "pterygoid bone" by many investigators.

In Rhinatrema, in Gymnopis, and in Siphonops the internal naris is enclosed by the maxilla-palatine. In Caecilia, Chthonerpeton, and Typhlonectes the internal naris is enclosed on the outer side by the maxilla-palatine and on the inner by the prevomer.

The frontals are in contact in Rhinatrema, in Gymnopis, in Chthonerpeton, and in Typhlonectes. They are separated by the "ethmoid" in Siphonops and in Caecilia. The former condition would seem primitive.

In Rhinatrema, in Chthonerpeton, and in Typhlonectes there is a wide gap between the squamosal and the parietal, and the temporal muscles are not covered by bone. In Gymnopis, Siphonops, and

Caecilia squamosal and parietal are in contact, and the temporal muscles are roofed by bone. The former condition would appear to be primitive.

The three genera with a gap between squamosal and parietal have markedly "kinetic" skulls, with considerable movement between the "maxillary segment" and the "occipital segment." They are "monimostylic" as the quadrate is firmly attached to the squamosal. The three genera without a gap between squamosal and parietal have much less movement between the segments of the skull, and are less "kinetic" but are just as much "monimostylic." The former condition would appear to be primitive.

On these characters, Rhinatrema is alone. Its skull characters, as well as its other characters, seem to me to be primitive.

Gymnopis differs in skull characters from Siphonops only in having the frontals in contact, in which trait as in its other characters it seems to me to be more primitive.

Chthonerpeton and Typhlonectes agree in all significant cranial characters.

Caecilia stands alone, and is the most specialized of the genera in cranial characters.

The cranial characters of American Caecilians align them in relation to each other in the same way and the same order as do their other characters.

While I am quite aware of previous remarks on the cranial characters of American Caecilians, and aware that the above remarks disagree with some of them, I offer no apologies. The statements given above result from examination of all the American genera at the same time, and consequent comparison of one with another. All the statements are from my own observations and none are from any other sources.

The tentacle

Statements in the literature give the impression that the tentacle of American Caecilians is present in two quite different conditions: a valvular or flap-shaped tentacle, in a horseshoe-shaped groove or aperture, attached posteriorly to the skin of the head; a globular tentacle in a circular aperture or groove. This is erroneous, as all American Caecilians have a quite similar tentacle and aperture, all of the first type. In American Caecilians the second type is an occasional consequence of unusual retraction of the organ, and careful observation will disclose the posterior attachment. This occurs more often in

specimens of Gymnopis. The two appearances may be present on opposite sides of the same individual. The tentacular aperture is the posterior end of the naso-lachrymal duct.

The anatomical base of the tentacle is, in all forms, the anterior border of the eye socket, and this is also the place of origin of the organ embryologically. It may therefore be inferred that the original position of the aperture was on the side of the head, just anterior to the eye. This is the position in all Rhinatrema and in most forms of Gymnopis and Siphonops. In the races of *G. mexicanus*, in *G. albiceps* and in *G. parviceps* the aperture is further forward, but nearer the eye than the nostril. In a single specimen of *G. m. mexicanus* (of 66 examined) the aperture is exactly equidistant between nostril and eye. In 8 specimens of *Siphonops annulatus* (of 175 examined) the aperture is further forward, in one nearer the nostril than the eye.

In Chthonerpeton the aperture is, in *viviparum*, slightly nearer the eye than the nostril; in *indistinctum* it is slightly nearer the nostril than the eye; in *petersi* and in all forms of Typhlonectes it is directly behind the nostril.

In all forms of Caecilia the aperture is on the under side of the snout, below and slightly posterior to the nostril.

The vent

The vent is an unmodified opening except in Chthonerpeton and in Typhlonectes, where the area surrounding it becomes modified into a sucking disk. Every stage in this transition may be seen in the three species of Chthonerpeton. The disk is slightly developed in *C. viviparum*, intermediate in *C. petersi*, and large in *C. indistinctum* and in all Typhlonectes.

Sex

American Caecilians have no external signs by which they may be sexed. Males have a median intromittent organ, which is occasionally extruded, perhaps during the death throes. Pregnant females of viviparous species are quite stout, and may have the hinder portion of the body enlarged. It is usually necessary to dissect in order to determine the sex. No variation in number of segments, of secondaries, or of scale rings has so far been found correlated with sex.

Annular grooves

In all American Caecilians the muscle segmentation is marked externally by grooves, the "*primaries*." These correspond in position to the ends of ribs and therefore to vertebrae. A count of them gives the number of vertebrae. They are precisely identical to the "costal grooves" of salamanders. They may extend completely around the body, but are frequently incomplete dorsally and, less often, ventrally.

In American Caecilians the number of these primary grooves ranges from 76 (in *Chthonerpeton indistinctum*) to 285 (in *Caecilia bassleri*). The range 76–166 covers all specimens of Gymnopis, Siphonops, Chthonerpeton, and Typhlonectes. Rhinatrema has 108–198 primaries, and Caecilia has 110–285.

Individual variation is, of course, greater in forms with a high count. No age variation appears or is to be expected. No sexual variation has been discovered.

In Rhinatrema, in Gymnopis, and in most Caecilia, some or all of the segments are partly or completely divided by *secondary* grooves in the middle of the segment. In Rhinatrema these are present and complete in each segment, and it is impossible, without dissection, to distinguish between primary and secondary grooves. In this genus the number of vertebrae equals half the number of superficial rings. In Gymnopis and in Caecilia the secondaries are absent from the more anterior segments. In these two genera the secondary rings appear at first anteriorly as two unconnected grooves, between the primaries, and parallel to them, in the dorsolateral area. The first appearance is often asymetrical. They increase in length in the more posterior segments, the two join first dorsally, and then, towards the posterior end, ventrally. At the hind end they are exactly like the primaries, but as they rapidly become incomplete anteriorly on the under side it is not hard to make a separate count of the two sets. It is extremely important in these two genera to keep the primary and secondary counts separate.

These secondary grooves are an outward and visible sign of the presence of bony scales in the anterior half of the segment. The secondary counts given in this paper are all taken by beginning with the *first* incomplete (dorso-lateral) secondary groove to appear, and counting *all* the segments posterior to it.

Secondary grooves are present in all species of Rhinatrema (equal in number to the primaries and all complete); all species of Gymnopis (from a minimum of 10 anterior segments without them in *G. multi-*

plicata oaxacae to a maximum of 87 in *G. nicefori;* a maximum count of 121 in *G. multiplicata oaxacae*, a minimum of 13 in *G. parviceps;* anterior secondaries always incomplete, maximum complete 67 in *G. nicefori*); most species of Caecilia (from a minimum of 55 anterior segments without them in *C. dunni* to a maximum of 268 in *C. bassleri;* a maximum count of 94 in *C. armata;* anterior secondaries always incomplete, maximum complete 26 in *C. dunni*).

Secondary grooves are present or absent in two species of Caecilia (*C. guntheri*, 8–0); *C. pachynema*, 11–0).

Secondary grooves are unknown in three species of Caecilia (*C. caribea*, *C. degenerata*, *C. elongata*) in all species of Siphonops, of Chthonerpeton, and of Typhlonectes.

The individual variation in number of secondaries, and in number of complete secondaries, shows no correlation with age or sex.

Scalation

Bony cycloid scales are concealed beneath the skin anterior to both primary and secondary grooves in all Rhinatrema, all Gymnopis, and in most Caecilia. They are absent in all Siphonops, in all Chthonerpeton, and in all Typhlonectes. They invariably accompany secondary grooves. In Gymnopis and in Caecilia the first secondary conceals a single scale. A complete secondary conceals a complete ring of scales. Wherever secondaries are present there are scales present anterior to the primaries. They appear first in the dorsolateral area and extend further dorsally and ventrally as one passes back along the body. At the hind end each segment contains two complete rings of bony scales. In Rhinatrema, every segment of the body contains two complete rings of scales.

In some (but not in all) specimens of Caecilia without secondaries scales may be found in connection with the hindmost primaries. Ordinarily, lack of secondaries indicates lack of scales; presence of secondaries *always* indicates presence of scales.

Nieden (1913, Gymnophiona, p. 2) says: "scales . . . are in most genera restricted to the back (only Ichthyophis and Herpele have scales on the belly also) and are besides arranged in many rows in the hinder half only of each of the epidermal folds limited by two circular grooves." As may be seen from the foregoing remarks, none of the statements made by Nieden are correct. Scales are on the belly in Rhinatrema, Gymnopis, and Caecilia; there are never more than two rows or rings to a segment; they are usually in both halves of a segment.

The statement about "many rows" is obviously reached by examination of microscopic sections, as the scales of any one ring overlap each other considerably. There is *no* overlapping of the scales of one ring by those of another. My statements concerning scalation are derived from examining the scales *in situ* on the animals.

Dentition

American Caecilians bear teeth on the premaxillary and maxillary bones as an outer, upper row; on the prevomers and palatines as an inner, upper row; on the dentaries as an outer, lower row. An inner, lower row, sometimes present, has been considered splenial.

At one extreme of American variation the teeth are all similar, and relatively numerous in all rows. It is legitimate to infer that this is the primitive condition.

At the other extreme the teeth of the premaxilla-maxilla set and of the dentary set are progressively enlarged anteriorly into big hooked fangs, and are reduced in number. The inner mandibular row may be entirely absent. This condition is probably secondary.

The species of Rhinatrema, Chthonerpeton, and Typhlonectes have the presumably primitive condition, and no generic distinctions in dentition have been observed.

In Gymnopis and in Siphonops the teeth on the lower jaw are uniform but larger than those on the upper. The inner mandibular row is reduced to one tooth on a side (in *oligozona* and in *multiplicata*) or is entirely absent.

In Caecilia the anterior teeth on the lower jaw are much enlarged and sharply pointed; to a less degree this is true of the maxillary teeth. The inner mandibular row may consist of as many as four teeth on a side (five or six were reported for the types of *polyzona*); they may be reduced to one on a side or may be entirely absent.

Accurate counts of the number of teeth in any given row are well nigh impossible to make unless the specimen is stained and cleared, or unless it is made into a skull. Either of these two operations enables one to count the teeth *and* the sockets, and thus arrive at an accurate statement of the total dentition. Such treatment is obviously impossible for most of the specimens. I am profoundly skeptical of dental characters in these animals as a basis for specific discrimination, having found considerable variation in count between the two sides of the same individual in skulls and in cleared specimens.

The presence of enlarged, sharply pointed, anterior teeth in all

American Caecilians with the tentacular aperture under the nostril (and only in these) tends to establish the genus Caecilia as here treated.

The great reduction or absence of the inner mandibular row in the species here considered Gymnopis and Siphonops (in connection with other characters) confirms their alliance.

Chthonerpeton viviparum (with 3–4 teeth in the inner mandibular row), and *Siphonops brasiliensis* (with none), are otherwise so similar that they have been confused. Aside from this I know of no case where it is necessary to examine dentition in order to arrive at specific or generic identification, and it is not absolutely necessary even in this case.

Dimensions

The smallest individual seen is a specimen of *Gymnopis nicefori* 100 mm. long. Perfectly formed young 76 mm. long have been taken from the oviduct of a pregnant *Gymnopis parviceps*. The smallest species are: *Siphonops hardyi* (nine specimens with a maximum length of 178 mm.) and *Gymnopis parviceps* (a single pregnant female 180 mm. long).

Eleven species (5 Rhinatrema, 2 Siphonops, 4 Gymnopis) have their maximum recorded lengths under 251 mm. The maximum length recorded outside the genus Caecilia is 695 mm. Six species of Caecilia exceed this length, and three (*tentaculata* 1075 mm., *abitaguae* 1200, *thompsoni* 1375) exceed a meter. The maximum length attained by Caecilians in the Old World is 500 mm.

A diameter of 30 mm. is attained by *Gymnopis m. mexicana*, by *Caecilia tentaculata*, and by *Typhlonectes compressicauda natans*.

If Caecilians were represented in collections only by specimens ideally collected and preserved, accurate measurements of length and of diameter could be taken with little difficulty, and the ratio of length to diameter would be very reliable. Actually, specimens have to be measured in every conceivable state of preservation and distortion. There is wide discrepancy in the length measurement of a number of specimens as taken by different observers, it is impossible to avoid a possible error of as much as a millimeter in diameter measurements, and 1/d ratios presented here are in no case carried into decimals, and in most cases give a range of variation which exceeds that of the animals in life.

Stout species are often slimmer when young and vice versa. Many seem to retain the same proportions throughout life.

A small *Typhlonectes c. compressicaudus* has an l/d ratio of 12, and a pregnant female *Gymnopis m. mexicanus* one of 14. No Rhinatrema seen has an l/d ratio of over 30. Outside of Caecilia the slimmest specimen seen is a *Gymnopis nicefori* with a ratio of 67. Seven species of Caecilia may be more attenuate than this, and *Caecilia bassleri* may be 160 times as long as wide.

The most elongate forms have the most vertebrae, but otherwise there is not too much correlation, and there is a wide range of vertebral count among equally stout forms.

The body is roughly cylindrical in most forms, and the diameter is the same from neck to vent. This statement is not true for Typhlonectes, which is compressed laterally, and has the posterior part of the body much deeper than the anterior. In this genus there is also a dermal dorsal fin fold, restricted to the posterior third in *compressicauda* and extending nearly to the head in *kaupii*.

In Rhinatrema there is a tail. In other genera the body ends bluntly just behind the vent.

Coloration

The majority of the forms have no definite markings, being dull blackish above, somewhat lighter below. The head is usually somewhat lighter than the dorsal surface, and the anal region is usually whitish.

The ventral surface is much lighter than the dorsal surface in some Gymnopis, and spotted or mottled with white in some Caecilia.

The primary grooves are white in two species of Siphonops (*annulatus* and *paulensis*), in marked contrast to the dark background of the segmental folds which they delimit. The reverse of this is seen in some Caecilia (principally *ochrocephala* and *polyzona*). In these the grooves are black and the folds are of a lighter color.

Yellow spots, one on each side on the segmental folds, are quite usual in *Caecilia pachynema*, and occur sporadically in a few other species of Caecilia.

Vivid yellow lateral stripes, one on each side, from jaw to vent, are present in three species of Rhinatrema (*bivitatum*, *parkeri*, and *bicolor*).

Habitat and habits

Something about the habitat may be inferred from the range given for a species. I have included the few ecological notes under the specific headings.

The climatic and botanic areas inhabited are: tropical rain forest; tropical deciduous forest; tropical savanna; temperate forest; temperate savanna. In North America the only temperate areas inhabited are montane cloud forest; it is probable that the animals occur in savanna only in galeria forest along rivers.

Except for the aquatic, river-dwelling Typhlonectes it is probable that all are terrestrial and burrowing. I have seen only three forms (*Gymnopis multiplicata proxima*, *Gymnopis parviceps*, and *Caecilia ochrocephala*) alive in the field, and the literature is singularly uninformative.

The animals are unquestionably carnivorous, but the precise aliment is not known.

Notes in literature indicate that they are preyed on by snakes; *Ninia atrata*, *Pseudoboa clelia*, *Sordellina brandonjonesi*, and several species of Micrurus being mentioned.

Males have a median intromittent organ and fertilization is presumably internal.

Published observations would indicate that Rhinatrema and Siphonops are oviparous, and that Gymnopis, Chthonerpeton, and Typhlonectes are viviparous. The behavior of Caecilia is not positively known, but as no embryos have been found in females it is probably oviparous.

External gills have only once been reported for larvae (Rhinatrema. They have been reported for embryos in the eggs of Rhinatrema, and of Siphonops, and for embryos in the oviducts of Chthonerpeton and Typhlonectes. They have been reported absent in embryos in the oviducts of Gymnopis. In Rhinatrema these gills are in three pairs, the two anterior fimbriated, but with rather few filaments. The gills of Siphonops are similar but the posterior may be absent. The gills of Chthonerpeton and of Typhlonectes are a single pair of large, flat, leaf-like structures. It is probable that these are entirely embryonic, and that the one case of birth with persistent gills was premature.

Free living (? aquatic) larvae without gills, but with a single pair of gill slits have been noted in Rhinatrema and in Caecilia. Well formed embryos in the oviducts of Gymnopis do not have gill slits. Normally born young of Typhlonectes lack gill slits, and gill slits were not reported for embryos of Chthonerpeton or of Typhlonectes, although external gills were present.

Gymnopis, Chthonerpeton, and Typhlonectes normally give birth to small replicas of the adult. Rhinatrema has a larval stage, which

is presumably aquatic, and which emerges from eggs laid by the mother. Siphonops lays eggs, but whether there is a larval stage is not known. Caecilia was reported long ago to have a larval stage. It is not certain that this is correct. It is not certain, but it is probable, that Caecilia lays eggs. It is peculiar that less is known of the breeding habits of Caecilia than of the other five genera, since specimens of Caecilia make up nearly 40% of those in collections.

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I have seen a specimen from the Museo Nacional of Salvador.

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No single museum has anything like a complete set of the forms of American Caecilians (6 genera, 44 forms). The three best are: British Museum (6 genera, 28 forms); American Museum (6 genera, 25 forms); Museum of Comparative Zoölogy (5 genera, 22 forms). These three collections together contain 38 forms, lacking only *Rhinatrema bivitatum*, *Rhinatrema colombianum*, *Siphonops insulanus*, *Caecilia subnigricans*, *Caecilia abitaguae*, and *Caecilia armata*.

Seven forms are not represented by specimens in any museum in this country (*Rhinatrema bivitatum*, *R. columbianum*, *R. parkeri*, *Siphonops insulanus*, *Caecilia güntheri*, *C. armata*, *Chthonerpeton petersi*).

Identification and methods

Measurements are given in millimeters. In Rhinatrema body length is from tip of snout to posterior end of anus; tail length is from latter point to tip of tail. In other genera only total length is given.

Primaries are counted first, then secondaries, then number of complete secondaries. It is sometimes easier, and just as accurate, to count the primaries down to the first secondary, and get the number of secondaries by subtracting this count from the total number of primaries. The foremost secondary is to be found in the dorso-lateral area, sometimes isolated from its successors. The primary and secondary counts must be kept separate.

The position of the tentacle should be noted.

Tentacle position, primary and secondary count, and l/d ratio will ordinarily serve to identify any American Caecilian. It may sometimes be necessary to examine the dentition. In Caecilia attention should be paid to color and condition of eye and geographical probability.

The inner mandibular teeth, if present, are barely anterior to the edge of the tongue, the anterior teeth of the two rows close together. They are usually rather concealed in the gums, and their tips are on quite a different level from those in the outer mandibular row, so that it is not hard to overlook them.

Most descriptions of Caecilians in literature are much too long, repeating for the individual or for the species statements true of every member of the genus. This serves no useful purpose and may be confusing.

In cross-section the animals (except for the laterally compressed Typhlonectes) are circular when alive. Various preservatives and death throes may cause muscular contractions which materially alter this. Most prominent of these is contraction of the obliquus externus muscle, which makes a more or less marked dorso-lateral fold appear. This has fortunately not caused any difficulty in America, but one Old World form has been described as a new species on this basis, the fold being imagined to be "glandular".

The synonymies give, I hope, most of the papers with information on range, habits, relationships, and systematic treatment of each species. No attempt whatever has been made to include the multifarious references in anatomical papers to a few of the species, principally to *Siphonops annulatus*. Much of this material may be found in the bibliography given by the Sarasins (1890, Erg. nat. Forsch. Ceylon, 2, pts. 3–4) and in Werner's compilation (1931, in Kukenthal, Handb. Zool. 6, 2, pp. 143–208, ff. 231–338, bibliography). The latter work is extremely good and useful, but the systematic section extends only as far as genera, and is taken from Nieden (1913, Die Gymnophiona, section 37 of Das Tierreich), and Nieden's work, while the latest treatment of the Caecilians of the world, extending down to species, is compilation pure and simple.

Key to genera of American Caecilians

A. Secondaries as numerous as primaries; a tail (tentacle immediately anterior to eye; teeth uniform, inner row of mandibular teeth well developed) . . . . Rhinatrema (p. 456)

AA. Secondaries (if present) not as numerous as primaries; no tail.

B. Tentacle under nostril, under tip of snout (anterior maxillary and outer mandibular teeth enlarged and pointed; inner mandibular row well developed to absent; secondaries from half as numerous as primaries to entirely absent; scales present or absent) . . . . Caecilia (p. 494)

BB. Tentacle on side of head.

C. Secondaries present (teeth of a row uniform, maxillary teeth smaller than outer mandibular; inner mandibular row one tooth or absent; tentacle nearer eye than nostril)
Gymnopis (p. 461)

CC. No secondaries (no scales).

D. No dorsal fin.

E. Tentacle nearer eye than nostril; no inner mandibular tooth row; primaries mostly complete; no anal disk
Siphonops (p. 479)

EE. Tentacle usually nearer nostril than eye; inner mandibular tooth row well developed; primaries usually incomplete dorsally; an anal disk. . Chthonerpeton (p. 527)

DD. A dorsal fin (tentacle close to nostril; inner mandibular tooth row well developed; primaries incomplete dorsally; an anal disk) .... Typhlonectes (p. 532)

This key may not serve to separate all specimens of Siphonops from Chthonerpeton (especially *S. brasiliensis* and *C. viviparum*). It would be advisable to consult the specific descriptions in the case of specimens from Southeastern Brazil.

"*Siphonops syntremus*" of Cope, from Northern Central America, was said to have: secondaries not so numerous as primaries; a tail; tentacle on side of head just posterior to nostril; mandibular teeth large and few. The unique type is lost. This combination of characters is otherwise unknown.

Rhinatrema Duméril and Bibron

1841. *Rhinatrema* Duméril and Bibron, Erpét. Gen. **8**, p. 288 (monotype *Caecilia bivitata* Cuvier).

1883. *Epicrionops* Boulenger, Ann. Mag. Nat. Hist. (5), **11**, p. 202 (monotype *E. bicolor* Boulenger).

Diagnosis. Caecilians with a distinct pointed and flattened tail; primaries 108–198 on body; secondaries as numerous as primaries, all complete; body and tail with two complete rings of bony scales in each segment; 1/d 20–30; tentacle in horseshoe-shaped groove, immediately anterior to eye and very small; eyes visible; teeth of any row uniform; inner mandibular tooth row well developed; length 145–370 mm.; six forms.

Range. Colombia, Ecuador and Peru. The Guianas. Sea level (?) to 3900 feet elevation.

Key to forms of Rhinatrema

A. Tail very short, much less than 5 mm. long; (striped; primaries 167–181; Guiana) .... *bivitatum*

AA. Tail 8–20 mm. long; tail segments 5–25.

B. Primaries on body 198; striped; Colombia .... *parkeri*

BB. Primaries on body 191; uniform; Guiana .... *nigrum*

BBB. Primaries on body 140–175; uniform; Peru ... *peruvianum*

BBBB. Primaries on body 117–135; striped; Ecuador and Peru. *bicolor*

BBBBB. Primaries on body 108; uniform; Colombia .. *columbianum*

Remarks. I keep all these forms in the original genus Rhinatrema in spite of the fact that there is an obvious dichotomy between the type of Rhinatrema with scarcely any tail, and the other forms (including the type of Epicrionops) which have a well developed tail. Young specimens are difficult to count with accuracy, and sometimes seem to differ in color from adults (cf. uniform young from the type locality of *parkeri*, and uniform young from an area inhabited only by the striped *bicolor*). I have seen 19 specimens and know of three that I have not seen. I have examined the types of all the species with the exception of *columbianum*.

RHINATREMA BIVITATUM (Cuvier)

1829 *Caecilia bivitata* Cuvier, Regne Animal, (2), **2**, p. 100; Guérin-Méneville 1829–1838, Iconogr. Regne Animal, **3**, Rept., pl. 25, f. 2.

1831. *Caecilia bivittata* Gray, in Griffith's Cuvier's Animal Kingdom **9**, app., p. 110.

1841. *Rhinatrema bivittatum* Duméril and Bibron, Erpét, Gen. **8**, p. 288, pl. 85, f. 4; Duméril 1863, Mem. Soc. Cherbourg **9**, pl. 1, f. 5, 12; Vaillant 1895, CR. Acad. Sci. **120**, p. 460; Boulenger 1895, Proc. Zool. Soc. London, p. 407; Nieden 1913, Gymnophiona, p. 14.

1879 *Ichthyophis glutinosus* (part), Peters, Mon. Ak. Berlin, p. 928, 931, f. 2.

Type. Paris No. 8.

Type locality. Cayenne.

Range. French Guiana.

Diagnosis. A striped Rhinatrema, with tail at most 2 mm. long; primaries 167–181; 1/d 24–30; 195–300 mm. long.

Description. Nothing can be added to the diagnosis.

Remarks. This species was originally of rather uncertain locality,

and was confused with *Ichthyophis glutinosus* of southeastern Asia in the literature. The type is fortunately preserved and shows that this confusion was baseless. As the first known species of the most primitive American genus, the confusion with the most primitive Old World genus is not incomprehensible.

Specimens seen. 3 as follows:

		prim.	length	length of tail	diam.	1/d
Cayenne,	Paris 8	181	210		7	30
Guiana,	Paris 8a	167	195	2	8	24
São Paulo	Hamburg 5268	169	300		10	30

N.B. Quite likely São Paulo is an erroneous locality.

RHINATREMA PARKERI spec. nov.

Type. BMNH 97-11-12, 23.

Type locality. Medellin, Colombia.

Range. Known only from type locality.

Diagnosis. A striped Rhinatrema with well developed tail (10 mm.); body primaries 198; 1/d 26.5; 212 mm. long.

Description. The type has two light stripes; 198 primaries on body and 12 on tail; total length 212 mm., tail 10 mm.; diameter 8 mm.

Remarks. The type has more body primaries than any other Rhinatrema examined, the nearest approaches being made by the striped *bivitatum* of Guiana (181) which has a very short tail; the uniform *nigrum* of Guiana (191); the uniform *peruvianum* of Peru (175). The other species known from Colombia, *columbianum* from the Province of Cauca, is uniform and has only 108 body primaries.

A larval Rhinatrema from Medellin, AMNH 1380, may possibly belong to this species. It is not in the best of condition and I cannot count its annuli. It is uniform black; has one gill slit but no external gills; length 162 mm., tail 10 mm.; diameter 8 mm.; 1/d 20.

I take great pleasure in naming this form after my friend H. W. Parker, of the British Museum of Natural History, to whom I am vastly indebted for help and advice, and to whom all herpetologists are indebted for his papers on Caecilians.

Specimens seen. Two, the type and one larva.

RHINATREMA NIGRUM spec. nov.

Type. AMNH (specimen mislaid, and number in my notes, 34088, either incorrect or duplicated).

Type locality. Arundabara, British Guiana, elevation 2200 feet.

Range. Known only from type locality.

Diagnosis. Uniformly dark; tail well developed (11 mm.); 191 body primaries; 1/d 23; length 211 mm.

Description. The type has, in addition to the diagnostic characters, 13 tail primaries; a diameter of 9 mm.

Remarks. This form differs from *parkeri* of Colombia, which has a similar segment count (198) in color; it differs from the other Guiana species, *bivitatum*, in color, in having a well developed tail, and in having ten more body segments; it differs from *peruvianum* in having sixteen more body segments.

Specimens seen. One, the type.

RHINATREMA PERUVIANUM Boulenger

1902. *Rhinatrema peruvianum* Boulenger, Ann. Mag. Nat. Hist. (7), **10**, p. 153; Nieden 1913, Gymnophiona, p. 15; Noble 1927, Ann. New York Acad. Sci., p. 59, f. 5.

Type. BMNH 1902–5–29, 207.

Type locality. Marcapata Valley, southeastern Peru.

Range. Southeastern Peru.

Diagnosis. A uniformly colored Rhinatrema; tail 17–20 mm. long; primaries 140–175; 1/d 20–23; 280–370 mm. long.

Description. Uniform brown.

Specimens seen. 4, as follows:

Peru:	body prim.	tail prim.	body length	tail length	diam.	1/d
Marcapata Valley						
BMNH 1902–5–29, 207	175	14	280	917	12	23
"Juliaca," AMNH 1454	140	15	320	20	16	20
" AMNH 1457	—	—	65	6.5	3	19 embryo
No data, Vienna	152	—	370	20	17	21

Remarks. Noble (1927) has pointed out that this species is ovi-parous, and has figured an encapsuled embryo, with external gills.

The locality Juliaca is probably erroneous. Dr. Harvey Bassler has suggested that the specimens so labeled, sent by a member of the Inca Mining Co., came from the vicinity of the mine at Santo Domingo, north of the shipping station of Juliaca, and at about 3000 feet above sea level.

The embryo has branchial structures as described by Parker for *bicolor*. Its tail has a dorsal and a ventral finfold.

Rhinatrema bicolor (Boulenger)

1883. *Epicrionops bicolor* Boulenger, Ann. Mag. Nat. Hist. (5), **11**, p. 203.
1895. *Rhinatrema bicolor* Vaillant, C. R. Ac. Sci., **120**, p. 461; Boulenger 1895, Proc. Zool. Soc. London, p. 407, pl. 23, f. 2; Nieden 1913, Gymnophiona, p. 15; Parker 1934, Ann. Mag. Nat. Hist. (10), **14**, p. 265.

Type. BMNH 78-1-25, 110.

Type locality. Intac, Ecuador [3900 feet elevation in western Ecuador].

Range. Western Ecuador and the eastern part of Ecuador and of Peru.

Diagnosis. A striped Rhinatrema; with tail 8–15 mm. long; primaries 117–135; 1/d 16–27; 145–250 mm. long.

Description. The color of the La Merced specimens was a dark purplish brown; on each side a ventrolateral yellow band from jaw to vent.

Specimens seen; 9, as follows:

	body prim.	tail prim.	length	tail length	diam.	1/d
Ecuador:						
Intac: BMNH 78-1-25, 110	117	12	225	8	9	25
East Ecuador AMNH 46205	130	10	210	14	13	16
Peru:						
La Merced, Chanchamayo Valley, 3000–3500′						
AMNH 42858	135	25	241	15	9	27
" 42859	124	22	194	12	8	24
" 42860	124	19	250	14	10	25
" 42861	130	22	225	13	9	25
Chanchamayo or Perene						
AMNH 17304	118	12	220	13	10	22
" 17305	119	11	230	13	11	21
" 17306	128	12	—	—	—	—

Remarks. Parker (1934) has recorded a larva, probably of this species, from Zamora, Ecuador (3250 feet, east of the Andes). It had about 135 primaries, uniform body color, length 145 mm., tail 9.

"Three pairs of small external gills are persistent, the two anterior pairs fimbriated, with five or six finger-like processes, and the last reduced to a mere knob; ventral to this last is a single oblique slit-like gill-cleft equipped with a large valvular flap on each side and lying in a circular depression."

It would seem that this species occurs on both sides of the Andes. It is thus either able to cross the passes, some of which are fairly low in Ecuador, or, and more probably, it antedates the present elevation of these mountains.

Rhinatrema columbianum Rendahl and Vestergren

1938. *Rhinatrema columbianum* Rendahl and Vestergren, Arkiv f. zool. **31**A, **3**, p. 1, ff. 1–3.

Type. Stockholm 19, collected by Kjell von Sneidern.

Type locality. El Tambo, Prov. Cauca, Colombia, about 1000 m. elevation.

Range. Known only from type locality.

Diagnosis. A Rhinatrema without stripes; tail well developed (8.7 mm. long); primaries 108; 1/d 20.; total length 161 mm.

Description. "227 . . . skinfolds, of which 11 are on the tail"; 108 primaries and 108 secondaries on body; 5–6 primaries on tail; "greatest body diameter 20.1 times in total length; tail length 18.5 in total length"; black, uniform; anal region whitish; total length 161 mm. The tail length would appear to have been 8.7 mm.; the diameter to have been 8 mm.

Remarks. This is the shortest bodied member of the genus. The next shortest, *bicolor* of Ecuador and Peru, is striped and has 117–135 body primaries. The other Colombian species, *parkeri*, is striped, and is the longest bodied member of the genus, with 198 body primaries.

Gymnopis Peters

1874. *Gymnopis* Peters, Mon. Berlin Ak., p. 616 (monotype *Gymnopis multiplicata* Peters).

1879. *Dermophis* Peters, Mon. Berlin Ak., pp. 930, 937 (genus based on *Siphonops mexicanus* Duméril and Bibron and *Dermophis brevirostris* Peters. Four *species inquirenda* were also included. Noble designated *mexicanus* as type in 1924, in Bull, Amer. Mus. Nat. Hist. **49**, **11**, p. 305).

1883. *Cryptopsophis* Boulenger, Ann. Mag. Nat. Hist. (5), **12**, p. 166 (monotype *Cryptopsophis multiplicatus* Boulenger).

1924. *Gymnophis* Barbour, Proc. Biol. Soc. Washington **37**, p. 125 (*pro Gymnopis* Peters).

Diagnosis. Caecilians without a tail; primaries 95–158; secondaries 13–121; scales always present; 10–87 primary folds without secondaries; 1/d 14–67; tentacle in horseshoe-shaped groove on side of head between eye and nostril and nearer the former; few or no teeth in inner mandibular row; mandibular teeth larger than maxillary or palatine; teeth of a row uniform; eye visible or invisible, in orbit or under bone; length 100–510 mm.; eleven forms.

Range. Vera Cruz and Guerrero, Mexico, to western Panamá. Apparently absent from Yucatan Peninsula. Cauca and Magdalena Valleys, Colombia. Ecuador. French Guiana. Sea level to 4500 feet.

Key to forms of Gymnopis

A. North American species.
- B. Eye visible; tentacle slightly nearer eye than nostril; primaries 110 or less.
  - C. Secondaries 32–80.
    - D. 1/d 14–26.
      - E. Secondaries 51–80 . . . . *mexicana*
      - EE. Secondaries 41 . . . . *clarkii*
    - DD. 1/d 25–32 . . . . *gracilior*
  - CC. Secondaries 13 . . . . *parviceps*
- BB. Eye invisible (if visible tentacle extremely close to eye); primaries 112 or more.
  - C. Secondaries 84–121.
    - D. Eye usually visible; primaries 121–137, secondaries 101–121 . . . . *oaxacae*
    - DD. Eye invisible.
      - E. Primaries 128–132 . . . . *multiplicata*
      - EE. Primaries 112–126 . . . . *proxima*
  - CC. Secondaries 62–74 . . . . *oligozona*

AA. South American species.
- B. Eye visible; tentacle slightly nearer eye than nostril; primaries 124–125 . . . . *albiceps*
- BB. Eye invisible (if visible tentacle extremely close to eye).
  - C. Primaries 100–120 . . . . *unicolor*
  - CC. Primaries 133–15 . . . . *nicefori*

A tabular list of counts of Gymnopis

Specimens seen	Form	Primaries	Secondaries	Primaries minus Secondaries	1/d
1	parviceps	96	13	83	22
4	gracilior	95–102	32–78	22–68	25–32
66	mexicana	97–110	51–80	26–59	14–26
4	clarkii	101–107	41	60–66	16–19
15	unicolor	100–120	22–74	41–87	27–40
38	proxima	112–126	84–104	15–36	23–34
2	albiceps	124–125	45–55	70–89	35–46
10	oaxacae	121–137	101–121	10–26	26–40
8	multiplicata	128–132	101–111	17–28	25–35
3	oligozona	128–135	62–74	57–68	44–64
6	nicefori	133–158	45–104	43–87	39–67
157					

Remarks. I have examined 157 specimens of this genus, including the types of eleven names. I have not examined the type of *Cryptopsophis multiplicatus* Boulenger 1883 in the British Museum (= *Gymnokis multiplicata proxima*) or the type of *Gymnopis multiplicata oaxacae* Mertens 1930 (Senck. Mus. 22130).

The generic name Cryptopsophis appears in the synonymy of Gymnopis because the type species and specimen is identical with an earlier described American form. The specimen was erroneously supposed to have come from the Seychelles Islands, and geography, rather than anatomy, seems to have prompted its description.

The generic name Dermophis appears in the synonymy of Gymnopis because the type species of Dermophis (*mexicanus*) appears to me to be congeneric with the type species of Gymnopis (*multiplicata*). Dermophis was characterized by having the eye visible, in an open orbit, whereas Gymnopis had the eye invisible and roofed over by bone. This difference exists as far as the two type species are concerned, but these two extremes are so bridged, in other forms, that generic distinction is impractical.

In general forms with visible eyes have the tentacular aperture slightly nearer the eye than the nostril. Forms with invisible eyes have the tentacular aperture very close to the eye and further from the nostril. Forms with visible eyes have, on the whole, no teeth in the

inner mandibular row; fewer primaries and secondaries; greater difference between primary and secondary count (= less of the body with bony scales). These criteria, which are not sufficiently clear cut to serve for dichotomy of the genus, indicate a vague division into two groups. One of these retains a well developed eye in an open orbit, but tends to a loss of scalation, a loss of the inner mandibular tooth row, and a more anterior position of the tentacular aperture. This group, containing *mexicana* and its races, *parviceps* and *albiceps*, is primitive in the retention of the eye, but presumably secondary in the other characters. The other group tends to reduction of the eye, but to retention of the inner mandibular tooth row, of the secondaries and scales, and of the posterior position of the tentacular aperture. This group contains *multiplicata* and its races, *oligozona*, *unicolor* and *nicefori*.

These two groups are more distinct in North America than they are in South America.

Specimens of *oaxacae* show the most complete scalation; specimens of *parviceps* show the most reduced scalation.

The "*Dermophis crassus*" of previous lists is, as appears from examination of the types, a straight synonym of *Siphonops annulatus*.

The difference in the present treatment of *mexicana* and of *multiplicata* and their races from that of Boulenger is a natural consequence of the examination of 157 specimens and 11 types by me, as against the examination of 13 specimens and 3 types by him.

GYMNOPIS MULTIPLICATA MULTIPLICATA Peters

1874. *Gymnopis multiplicata* Peters, Mon Ak. Berlin, p. 616, pl. 1, f. 1; 1879 Mon. Ak. Berlin, p. 939, f. 7; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 100; Cope 1885, Proc. Amer. Phil. Soc., **22**, p. 171; Boulenger 1895, Proc. Zool. Soc. London, p. 410; Günther 1902, Biol. Cent. Amer., Batr., p. 308; Nieden 1913, Gymnophiona, p. 21, f. 11; Dunn 1928 (in part), Proc. New England Zoöl. Club, **10**, p. 75.

1877. *Siphonops simus* Cope, Proc. Amer. Phil. Soc. **17**, p. 91; Brocchi 1883, Miss. Sci. Mex., p. 121.

1879. ?*Dermophis simus* Peters, Mon. Ak. Berlin, p. 938; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 99.

1885. *Gymnopis sima* Cope, Proc. Amer. Phil. Soc **22**, p. 171; 1887, Bull. U. S. Nat. Mus. 32, p. 9.

Type. Berlin No. 3705, collected by Warszewicz.

Type locality. Veragua.

Range. Pacific side, western Panamá and Costa Rica; Atlantic side, Honduras. Sea level to 4500 feet.

Diagnosis. A Gymnopis with invisible eyes; primaries 128–132; secondaries 101–111; difference 17–28; 1/d 25–35; length 358–510 mm.

Description. The few specimens seen afford no points other than those given in the diagnosis. The color is black, lighter below. Peters (1874) says there are 18 teeth on each side of the upper jaw.

Remarks. The species *Gymnopis multiplicata* may be divided into three races; *multiplicata* from the Pacific side, *proxima* from the Atlantic side, and *oaxacae* from Mexico. The differences are not great:

	prim.	sec.	diff.	
proxima	112–126	84–104	15–36	no eyes
oaxacae	121–137	101–121	10–26	eyes
multiplicata	128–132	101–111	17–28	no eyes

The criteria given above will serve to distinguish all *proxima* from the other two races, and almost all *oaxacae* from almost all *multiplicata*. The ranges are quite intelligible save for the single Honduras locality for *multiplicata*, which would seem to indicate that *proxima* holds territory between two areas of *multiplicata*. Specimens seen, eight, as follows:

	prim.	sec.	length	diam.	1/d
Honduras:					
Progreso Dist. MCZ 11048	131	104/10	365	12	30
Costa Rica:					
Tilaran USNM 70656	129	101/16	358	12	30
San Mateo USNM 37761	129	111/17	380	12	32
Cartago Coll. St. Luis Gonzaga	128	103	—	—	—
Taboga MNCR	—	—	—	—	—
No locality MNCR	128	111	370	11	34
" " USNM 29765	132	110/8	390	11	35 type *sima*
Panamá:					
Veragua Berlin 3705	131	105/9	510	20	25

Peters (1879) records it from Antioquia, Colombia, but it is very probable that this record was based on Berlin No. 9524 from Caceres, which is a specimen of *G. nicefori*.

Gymnopis multiplicata proxima (Cope)

1875. *Siphonops mexicanus* Cope, Journ. Acad. Nat. Sci. Philadelphia (2), **8**, p. 96.
1877. *Siphonops proximus* Cope, Proc. Amer. Phil. Soc **17**, p. 90; Brocchi 1883, Miss Sci. Mex., p. 121.
1879. *Dermophis ? proximus* Peters, Mon. Ak. Berlin, p. 938; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 99.
1883. *Cryptopsophis multiplicata* Boulenger, Ann. Mag. Nat. Hist. (5), **12**, p. 166 (Seychelles Is. *in errore*).
1885. *Gymnopis proxima* Cope, Proc. Amer. Phil. Soc. **22**, p. 171; 1887, Bull. U. S. Nat. Mus. **32**, p. 9; Boulenger 1895, Proc. Zool. Soc. London, p. 410; Günther 1902, Biol. Cent. Amer., p. 308; Nieden 1913, Gymnophiona, p. 21; Noble 1918, Bull. Amer. Mus. Nat. Hist. **38**, p. 346.
1928. *Gymnopis multiplicata* (part) Dunn. Proc. New England Zoöl. Club **10**, p. 75 (breeding habits); Parker 1936, Trans. Linn. Soc. London, 19, **4**, p. 455.

Type. USNM 29762–3, collected by Gabb.

Type locality. Eastern Costa Rica [= Limon].

Range. Nicaragua. Eastern Costa Rica, Prov. Bocas del Toro, Panamá. Sea level to 4500 feet.

Diagnosis. A Gymnopis with eyes usually invisible; primaries 112–126; secondaries 84–104; 15–36 primary folds without secondaries; 1/d 23–34; length 190–480 mm.

Description. Most specimens are distinctly lighter (even white) on the belly. The primaries are somewhat interrupted in the anterior dorsal region. ANS 4928, without locality, has the eye visible and not completely under bone. USNM 19614 has two inner mandibular teeth; the first scale appears on the side, under the primary, four segments anterior to the first secondary. The tentacle is much closer to the position of the eye than to the nostril.

Remarks. Specimens of my own collecting, from Guapiles, Monteverde and Suretka, Costa Rica; Farm Six near Almirante, Panamá; were under logs in damp pastures. One of the last was a pregnant female with one perfectly formed young in the oviduct. The embryo was 131 mm. long, 1/d 22., the mother was 375 mm. long, 1/d 25.

Specimens seen, 38, as follows:

	prim.	sec.	length	diam.	l/d
Panamá:					
Bocas del Toro USNM 38754	124	101/16	225	7	32
Coco Plum Estate, near Bocas MCZ 7990	119	97/10	365	12	30
Farm Six MCZ 9931	115	93/11	375	15	♀ 25
" " " 9932	116	85/9	250	11	23
Costa Rica:					
Suretka MCZ 9934	119	97/11	313	12	26
Limon USNM 29762	117	91/8	430	15	29
" " 29763	115	88/11	480	21	23
Salvadora Farm USNM 84241	116	92	—	—	—
Monteverde MCZ 7987	120	84/7	395	16	25
" " 7988	123	98/10	215	8	27
Reventazon USNM 38144	120	95/8	300	12	25
" " 38145	119	92/5	320	13	25
" " 38146	117	92/3	212	9	23
Guapiles MCZ 7989	124	104/9	380	15	25
Cariblanco BMNH 1907–10–9, 10	116	94/9	470	18	26
Peralta MNCR	—	—	—	—	—
Cartago Colleg. St. Luis Gonzaga	122	94/8	—	—	—
Parismina, M. Valerio coll.	—	—	—	—	—
5 km. North of Cartago MCZ 24526	112	91/9	425	18	24
No locality MCZ 24527	121	97/10	320	14	23
" " Seminario de San Jose	123	96/10	—	—	—
" " MNCR	121	98	—	—	—
" " "	118	86	—	—	—
Nicaragua:					
Rio San Juan (Colorado Jct.) USNM 19612	124	100/9	395	12	33
Rio San Juan USNM 19613	126	99/14	380	11	34
" " " " 19614	119	97/9	300	9	33
San Juan del Norte USNM 15630	118	92/8	340	15	23
" " " " USNM 15643	124	99/9	300	10	30
Bluefields USNM 37351	122	102/16	280	8	35
Escondido R. (50 mi. above Bluefields) USNM 20704	120	98/11	322	12	27

	prim.	sec.	length	diam.	1/d
El Bluffs, Bluefields AMNH 8397	121	99/8	—	—	—
Eden Mine AMNH 8399	116	101/16	375	11	34
Hac. Valencia, San Miguelito, Chontales Mts. AMNH 8396	122	103/11	470	19	26
Cape Gracias USNM 15311	122	102/16	280	8	35
San Ramon, 125 mi. up Rio Wanks BMNH 1908-5-29, 122	121	98/11	190	6	31
Boquete I. AMNH 8398	122	95/10	335	13	26
No locality USNM 15199	124	101/4	383	12	32
ANS 4928	118	97/10	277	9	30

Parker (1936) gives 119 primaries; 97 secondaries, last 10 complete; and 1/d 24 for the type of *Cryptopsophis multiplicatus*.

GYMNOPIS MULTIPLICATA OAXACAE Mertens

1930. *Gymnopis multiplicata oaxacae* Mertens, Abh. Ber. Mus. Magdeburg **6**, **2**, p. 153, f. 14.

Type. Senckenberg 22130, Dr. K. Lafrentz, Dec. 1927.

Type locality. Cafetal Concordia (900 m. alt., between Puerto Angel and Salina Cruz), Oaxaca, Mexico.

Range. Guerrero, Oaxaca, and Chiapas, Mexico.

Diagnosis. Eyes usually visible; tentacular aperture very close to eye; primaries 121–137; secondaries 101–121; difference 10–26; 1/d 26–40; length 153–430 mm.

Description. The eye is visible in nearly all specimens. I could not make it out in the Mirador specimen, and Mertens failed to see it in one of the type series of five, so that two out of 15 lack eyes. Only five have the secondary count below 111, and three have the difference over 16.

Remarks. Lafrentz (1928, Blätt. Aquar. Terr. 39, 6, p. 115) says that the type series came from the "dungheap of the mule stable" and that the native name is "metlapil." He gives a photograph.

USNM 115058 contained four well formed young 104 mm. long, and 4 mm. in diameter, 1/d 26. The eye was conspicuous in all.

This form with its visible eye, inner mandibular teeth, posterior tentacle position, and nearly complete scalation, is presumably the most primitive member of the genus.

Its relations are obviously with *multiplicata*, as all the characters

overlap, although it has been possible to allocate all specimens without recourse to locality.

Specimens seen, ten, as follows:

	prim.	sec.	length	diam.	1/d
Mexico:					
Guerrero:					
Xaltianguis USNM 115057	133	121/11	153	4	38
El Limoncito, 15 km. N. Acapulco, EHT 16869	127	106/8	275	7	39
Oaxaca:					
Mirador AMNH 13448	128	114	373	11	34 no eyes
Cafetal Concordia					
Berlin 31696	127	101/7	275	8	34
" 31696	125	111/8	350	10	35
" 31696	130	117/13	430	15	29
No locality Vienna	137	121			
Chiapas:					
Tonala, E. H. Taylor	121	106/16	331	9	37
La Esperanza USNM 115058	121	103/11	283	7	40
30 km. N.E. Escuintla, 900 m., Mich 88205	121	106/11	335	12	28
Mertens' counts:					
	124	111/10	295	13	26 type
	125	114/9	390	15	26
	126	112/10	430	15	29
	125	111/12	400	14	28
	121	111/9	295	11	27 no eyes

GYMNOPIS OLIGOZONA (Cope)

1877. *Siphonops oligozonus* Cope, Proc. Amer. Phil. Soc. **17**, p. 91.

1879. *Gymnopis oligozona* Peters, Mon. Ak. Berlin, p. 939; Cope 1885, Proc. Amer. Phil. Soc. **22**, p. 171; Dunn 1928, Proc. New England Zoöl. Club **10**, p. 76.

Type. USNM 25187.

Type locality. Unknown.

Range. Known only from Guatemala.

Diagnosis. A Gymnopis without visible eyes; tentacular aperture

remote from nostril; primaries 128–135; secondaries 62–74; 1/d 44–64; length 255 mm. to 305 mm.

Description. Rather uniform dark, the primary grooves lighter and the top of the head lighter. The type has 12 teeth on a side in the upper jaw, ten on a side in the prevomero-palatine series, nine outer mandibular and one inner mandibular. The tentacular aperture is horseshoe-shaped, concave posteriorly, and quite far back as in *multiplicata.*

Specimens seen, three, as follows:

	prim.	sec.	length	diam.	1/d
Guatemala:					
Finca El Volcán, Alta Vera Paz U. Mich., Field No. 224	128	71/20	305	7	44
No locality. BMNH 87–4–12, 2	135	74/15	292	6.5	45
No data. USNM 25187	130	62/11	255	4	64

Remarks. The type is absolutely without any data at all. The British Museum specimen was received from the Basle Museum, and said to have been collected in Guatemala by Bernouilli. A note in the British Museum catalog says that Bernouilli visited Palenque, Flores, and Lake Itza. The Michigan specimen, collected by L. C. Stuart, gives at last a definite locality.

It is possible that the type of *oligozona* also served as the type of *Siphonops syntremus* Cope. The geographic and anatomical relationships of this form are clearly with *G. multiplicata.*

Gymnopis nicefori Barbour

1924. *Gymnophis nicefori* Barbour, Proc. Biol. Soc. Washington **37**, p. 125.

Type. MCZ 9609, collected by Hermano Niceforo Maria, March 1924.

Type locality. Honda, Magdalena Valley, Colombia.

Range. Known from Honda, Girardot, and San Juan de Rio Seco in the Magdalena Valley, and from Caceres in the Cauca Valley, Colombia.

Diagnosis. A Gymnopis with eyes usually invisible, apparently not under bone; tentacle very close to eye; primaries 133–158; secondaries 45–104; 43–88 primary folds without secondaries; 1/d 39–67; length 100–245 mm.

Description. The eye is visible in the specimens from Girardot and

San Juan. The color is "dark slate color, head a little lighter" (Barbour l.c.). The dentition of the type is given by Barbour as "maxillary teeth many, apparently about thirty; mandibular probably about equal in number, in two rows [I find no inner row in the type]." The Girardot specimen has 7 premaxillary-maxillary teeth on a side; 12 palatine; 10 outer mandibular; 0 inner mandibular. The mandibular teeth are twice the size of the maxillary or the palatine.

The Honda and Girardot specimens (4) have 150–158 primaries; 97–104 secondaries; 1/d 39–67. The Caceres specimen has only 138 primaries. The San Juan specimen is tiny, ill-preserved for counting, but appears to have 133 primaries and 45 secondaries.

Remarks. Probably directly allied to *unicolor* of Guiana, but just as similar to *oligozona* of Guatemala. Its relationships with *albiceps* are obscure.

Specimens seen, six, as follows:

	prim.	sec.	length	diam.	1/d
Colombia:					
Honda MCZ 9609	153	104/60	193	5	39 Type
" AMNH 23387	158	102/63	233	5	47
" AMNH 23388	150	97	178	4	44
Girardot Inst. La Salle	152	100	200	3	67
San Juan de Rio Seco MCZ 16089	133	45	100	2	50
Caceres Berlin 9524	138	95/67	245	6	41

GYMNOPIS UNICOLOR (Duméril)

1863. *Rhinatrema unicolor* Duméril, Mém. Soc. Cherbourg, **9**, p. 321.
1863. *Rhinatrema concolor* Duméril, l.c., pl. 1, f. 6–7.
1879. *Gymnopis unicolor* Peters, Mon. Berlin Ak., p. 939; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 100; 1895, Proc. Zool. Soc. London, p. 410; Nieden 1913, Gymnophiona, p. 21.

Type. Paris 6 (three specimens one of which is labeled "type").

Type locality. Cayenne.

Range. Known only from Guiana.

Diagnosis. A Gymnopis with invisible eyes; primaries 100–120; secondaries 22–74; 41–87 primary folds without secondaries; 1/d 27-40; length 108–235 mm.

Description. Uniform dark.

Remarks. AMNH 1335, from "S. Amer.," has 22 fewer secondaries than have nine Guiana specimens, lowers their secondary count from 44 to 22, and raises the number of primary folds without secondaries from 64 to 87. Additional similar specimens, with locality, might be the basis for a different form.

Specimens seen, 15, as follows:

	prim.	sec.	length	diam.	1/d
Cayenne Paris 6	108	67/45	195	6	32
" "	113	63/45	205	6.5	31
" "	110	55/44	185	5.5	type 34
" BMNH 84-12-8, 5	115	68	230	6	38
" Berlin 9600	109	58	235	7	33
Guiana Paris 6a	—	—	160	5	32
" " 6b	114	—	187	6	33
" " 6c	120	56/22	200	6	33
" " 6c	118	74	195	5	39
" " 6c	113	59	200	6	33
" " 6c	—	—	154	5	30
" " 6c	—	—	109	4	27
" " 6d	—	—	108	3	36
Oke R., Cuyuni Trib., Brit. Guiana Field 35117	100	44/13	162	4	40
"S. Amer." AMNH 1335	109	22/5	189	5	34

Gymnopis albiceps (Boulenger)

1882. *Dermophis albiceps* Boulenger, Cat. Batr. Grad. Brit. Mus. (2), p. 98, pl. 8, f. 1.

Type. BMNH 80-12-5, 147.

Type locality. Ecuador.

Range. Known only from Prov. Santiago Zamora in the Oriente.

Diagnosis. A Gymnopis with visible eyes; tentacle between eye and nostril, slightly nearer eye; primaries 124–125; secondaries 45–55; 1/d 35–46; length 177–210 mm.

Description. "Blackish gray, the head white" (Boulenger, l.c.).

Remarks. This is the only South American Gymnopis with the tentacle remote from the eye. It has more primaries than any other form with a similar tentacle position. In counts of rings and in proportion

it is close to and somewhat intermediate between the Guianan *unicolor* and the Colombian *nicefori*, which have the eye usually invisible and the tentacle very close to the eye.

Specimens seen, two, as follows:

	prim.	sec.	length	diam.	1/d
Ecuador:					
No data. BMNH 80–12–5, 147	125	55	210	4.6	46
Prov. Santiago Zamora. Michigan 83051	124	45/15	177	5	35

Gymnopis mexicana mexicana (Duméril and Bibron)

1841. *Siphonops mexicanus* Duméril and Bibron, Erpét. Gen. **8**, p. 284; Cuvier 1849, Regne Animal (3), pl. 36, f. 1, 6; Duméril 1863, Mem. Soc. Cherbourg **9**, p. 318, pl. 1, f. 10; Brocchi 1882, Miss. Sci. Mex., p. 120, pl. 21, f. 2.

1850. *Siphonops mexicana* Gray, Cat. Batr. Grad. Brit. Mus., p. 59.

1879. *Dermophis mexicanus* Peters, Mon. Ak. Berlin, p. 927, f. 6; Cope 1879, Proc. Amer. Phil. Soc. **18**, p. 265; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 98, pl. 8, f. 2; Cope 1885, Proc. Amer. Phil. Soc. **22**, p. 171; 1887, Bull. U. S. Nat. Mus. **32**, p. 9; 1888, Journ. Morph. 2, **2**, p. 300, pl. 22, f. 6 (otic region); 1889, Bull. U. S. Nat. Mus. **34**, pl. 51, f. 21 (hyoid); Boulenger 1895, Proc. Zool. Soc. London, p. 404; Günther 1902, Biol. Centr. Amer., p. 305; Nieden 1913, Gymnophiona, p. 8; Ochoterena 1932, Ann. Inst. Biol. [Mexico] 3, **4**, p. 363 (integument).

1928. *Dermophis mexicanus mexicanus* Dunn, Proc. New England Zoöl. Club **10**, p. 74, pl. 5 (breeding habits).

Type. Paris 5c.

Type locality. Mexico.

Range. Oaxaca and Vera Cruz, Mexico, to western Nicaragua.

Diagnosis. A Gymnopis with visible eyes; tentacle between eye and nostril, slightly nearer eye; primaries 97–110; secondaries 51–80; 1/d 14–26; length 152–485 mm.

Description. The belly is usually light in color. The scales appear first in the posterior half of the segmental folds on the sides (after the eleventh primary in U. Mich. 64354a from Guatemala). They are present in both halves, dorsally, laterally and ventrally in the posterior part of the body where the secondaries are present and complete. Mich. 64354a has 7–8 premaxillary teeth; 11–12 maxillary; 17–18 palatine; 15 mandibular; no inner mandibular. USNM 51380 has the

tentacle equidistant from eye and nostril; U. Mich. 64354a has the tentacle 3 mm. from the eye and 4 mm. from the nostril, which is the usual position.

Sixty-two specimens have been counted for primaries and secondaries. The extremes are: five specimens with 97, 100, 110, 110, 110 primaries from Nicaragua, Central America, Nicaragua, Guatemala, and Mexico respectively; 57 specimens fall into the narrow range of 101–109 primaries. The extremes in secondary count are: 51, 51, 52, 78, 80, from "N. E. Mexico," Tabasco, Vera Cruz, Tehuantepec and Chiapas respectively; 57 specimens have from 55–75 secondaries. No sexual difference has been found in the counts of secondaries, primaries, or complete secondaries.

The length-diameter ratio (always somewhat untrustworthy) has been computed for 51 specimens. An adult pregnant female is, naturally, the fattest, with the low ratio of 14. The slimmest are 23, 24, 25, 26 from Mexico, and one with 24 from Salvador. The four fattest are two from Mexico and two from Guatemala. Aside from the pregnant female, no sexual difference can be made out, and no changes in proportions with age are apparent.

None of the figures on proportions or segment counts give any indication of a geographical trend.

Habits. The animal is viviparous. MCZ 12122 from Guatemala was a pregnant female 430 mm. long (Dunn 1928, pl. 5). It had six young in the left oviduct and four in the right. The young were 145 mm. long.

Remarks. This form with its three races resembles in tentacle position *parviceps* from Panamá and *albiceps* from Ecuador.

Specimens seen, 66, as follows:

	prim.	sec.	length	diam.	l/d
Mexico:					
Vera Cruz:					
Cuatotolapam Mich. 41571	107	72/12	327	19	17
41572	105	70/12	374	21	18
Vera Cruz ANS 4886	105	55/6	355	17	21
4887	105	55/6	228	11	21
4888	105	55/6	—	—	—
4889	106	59/6	340	19	18
4890	104	59/6	232	11	21
" " AMNH 6306	102	58/12	354	18	20

	prim.	sec.	length	diam.	1/d
Oaxaca:					
Tehuantepec MCZ 1604a	108	69/15	281	17	16
1604b	109	73/11	425	17	25
Hamburg 310	103	61	——	—	—
Barrios USNM 30535	106	78/11	378	24	16
30536	105	60/0	170	7	24
30537	——	———	——	—	—
Tabasco:					
Tabasco USNM 25102	105	61/9	365	18	20
Teapa BMNH 1907-12-19, 135	104	51/7	——	—	—
Chiapas:					
La Zacualpa AMNH 897	102	72/5	——	—	—
898	107	74/9	——	—	—
899	105	69/9	——	—	—
2½ km. W. Soconusco, 50 m. Mich. 88203	102	73/8	280	15	19
6 mi. NE. Escuintla, 150 m. Mich. 88202	103	74/14	350	23	15
88204	106	80/10	310	17	18
? State ?					
Finca Berlin 24051	——	———	460	30	15
St. Augustin Paris 5	104	69/10	475	27	17
"	101	62/6	387	19	20
"	106	73/10	388	17	23
"N.E. Mexico" ERD	110	51/5	395	15	26
"Mexico" Paris 5c	105	60/5	365	20	18
Berlin 9104	——	———	——	—	—
AMNH 13445	104	58/2	210	12	17
13446	105	61/2	283	13	22
13813	104	63/2	320	16	20
Guatemala:					
No locality USNM 25641	105	74/10	440	23	19
Hamburg 1926	103	70/6	——	—	—
Senck. 2098b	103	73/9	——	—	—
MCZ 12121	108	62/9	420	23	19
12122	109	69/10	430	30	14
12123	108	70/11	240	15	16

	prim.	sec.	length	diam.	1/d
Pacific side BMNH 64-1-26, 397	106	68/10	463	24	19
64-1-26, 152	110	62/7	390	18	22
Escuintla USNM 12691	—	—	—	—	—
Retalhuleu Senck, 2098a	107	72/16	—	—	—
Finca El Cipres, Volcan Suchil, Prov. Suchetepequez Mich. 64354	105	65/9	350	—	—
	102	65/14	485	29	17
	105	65/10	210	13	16
	104	66/11	222	14	15
	106	73/9	160	10	16
	106	73/8	172	10	17
	101	64/8	280	15	19
" MCZ 11222	108	67/8	460	22	21
11223	105	65/5	395	21	18
Salvador:					
Volcan Isalco ANS 4925	110	75/8	165	7	24
No data Mus. Na. Salvador	105	73/15	152	7	22
BMNH 1906-11-8, 2	107	64/7	395	20	20
Honduras:					
Amapala USNM 51380	107	68/7	350	18	19
No data Berlin 13207	103	61	—	—	—
Nicaragua:					
Polvon MCZ 1491a	105	60/11	—	—	—
1491b	107	57/7	350	16	22
2165a	104	54/10	185	9	20
2165b	106	70/15	395	20	20
" AMNH 1153	97	55/7	261	16	16
18667	105	59/12	305	16	19
No data USNM 16147	110	62/13	356	19	19
Mich. 65674	106	66/5	336	19	17
(?) Panamá:					
No data BMNH 67-9-23, 3	104	63/10	430	21	20
Central America:					
No data USNM 30008	100	64/9	345	18	19

It has also been recorded from Atitlan, Guatemala, by Brocchi (1883).

Gymnopis mexicana clarkii (Barbour)

1926. *Gymnophis clarkii* Barbour, Occ. Papers Boston Soc. Nat. Hist. **5**, p. 191.

1928. *Dermophis mexicanus clarkii* Dunn, Proc. New England Zoöl. Club **10**, p. 73.

Type. MCZ No. 11047, collected by Dr. Herbert Clark, June, 1925.

Type locality. Tela, Honduras.

Range. Known only from Tela and San Pedro Sula, Honduras.

Diagnosis. A Gymnopis with visible eyes; primaries 101–107; secondaries 41; 1/d 16–19; length 145–420.

Description. Only four specimens are known, so that little can be added to the diagnosis save that the color is "as usual, plumbeous," and that the tentacle is well in advance of the eye.

Remarks. The type was 145 mm. long, and since this is the length of an unborn embryo of *mexicana mexicana*, it must have been very young. The primary count is that of *mexicana*, and only the low secondary count (41 as against 51–80) distinguishes it.

Specimens seen, four, as follows:

	prim.	sec.	length	diam.	1/d
Honduras:					
Tela, MCZ 11047	107	41/0	145	9	16 TYPE
" " 11779	107	41/4	420	25	17
San Pedro Sula, AMNH 33386	101	41/5	350	18	19
No locality AMNH 49953	104	41	380	—	—

Gymnopis mexicana gracilior (Günther)

1902. *Dermophis gracilior* Günther, Biol. Centr. Amer., Amph., p. 306, pl. 76, f. B; Nieden 1913, Gymnophiona, p. 9.

1928. *Dermophis mexicanus gracilior* Dunn, Proc. New England Zoöl. Club, **10**, p. 73.

Type. BMNH 1901–12–19–137.

Type locality. Chiriqui, Panamá.

Range. Pacific slope of Costa Rica; Chiriqui, Panamá. Sea level to 4000 feet.

Diagnosis. A Gymnopis with visible eyes; primaries 95–102; secondaries 32–78; 1/d 25–32; length 192–345 mm.

Description. The color and the tentacle position are as in *G. m. mexicana.*

Remarks. Three out of four specimens of this species are slimmer than any *mexicana* seen. The exception is a pregnant female which is as stout as the slimmest *mexicana* seen. This individual contained six well formed young which measured 100–106 mm., and about 6 in diameter, yolk still being noticeable. The Panamá specimens have the usual secondary count of *mexicana*, but the single Costa Rican one has a very low count.

Specimens seen, four, as follows:

	prim.	sec.	length	diam.	1/d
Costa Rica:					
Pozo Azul BMNH 1907–6–28, 27	100	32	192	6	32
Panamá:					
Chiriqui BMNH 1901–12–19, 137	95	73/10	343	11	31
Boquete Cal. Acad.+Sci. 79463	99	68/8	325	13	25
Boquete Cal. Acad.+Sci. 79464	102	78/9	345	11	31

Gymnopis parviceps (Dunn)

1924. *Siphonops parviceps* Dunn, Occ. Papers Boston Soc. Nat. Hist. **5**, p. 93; 1928, Proc. New England Zoöl. Club, **10**, p. 74 (breeding habits).

Type. MCZ 9407, collected by E. R. Dunn and Chester Duryea, Aug. 6, 1923.

Type locality. La Loma (or Buenavista, another name), at elevation of 1200 feet (erroneously 2000 in original description), on the trail from Chiriqui Lagoon to David, Atlantic slope in Province of Bocas del Toro, Panamá.

Range. Known only from type locality.

Diagnosis. 96 primaries; 13 secondaries; 1/d 22.

Description. Primary folds all complete, extending to anus; secondary folds 13, first three incomplete; scales present all over in region of complete secondaries; maxillary teeth 13, palatine teeth 10, mandibular teeth 10; tentacle between eye and nostril, nearer to lip than to either, slightly nearer to eye than to nostril; eye nearer to lip than to

tentacle, nearer to lip than is the nostril; eyes farther apart than length of snout. Black; head lighter, tinged with brown. Length 180 mm.; diameter of head 5 mm., neck 5 mm., body 8 mm.; posterior angle of mouth to tip of snout 6 mm.; ratio of length to diameter 22.

Habits. We were eating breakfast in a palm thatch hut when one of our men called attention to a "snake" which was coming out of the ground under the raised platform on which we slept. The whole terrain was steep slopes. The animal was impossible to extricate from its burrow by pulling, and was dug out. The peculiar bottle-shape of the beast (possibly because it was a pregnant female) was immediately noticeable and was the cause of the difficulty of extraction. Later, three perfectly formed young were found in the right oviduct. They measure 76 mm., and the diameter is about 3.5 mm., 1/d 21.

Remarks. My lack of knowledge of South American forms and of the correlations of scales and secondaries in Caecilians led me to place this form originally in Siphonops. The eye and the tentacle are nearer the lip than in *Gymnopis mexicanus mexicanus*, but the relative distance of tentacle, eye, and nostril is the same in both.

The low secondary count makes the species remarkably distinct.

Siphonops Wagler

1828. *Siphonops* Wagler, Isis **21**, p. 742 (monotype *Caecilia annulata* Mikan).

Diagnosis. Caecilians with no tail; no secondaries; no scales; tentacle on side of head, between eye and nostril, nearer to eye and usually very close to it; no inner mandibular tooth row; no dorsal fin; anal region not a sucking disk; eye usually visible; primaries 81–133; 1/d ratio 16–54; length 126–535 mm.; five forms.

Range. Colombia to southern Brazil and Paraguay. Argentina (?)

Key to species of Siphonops

A. Large species; primaries grooves white.
  B. Primaries 81–100; black and white in preserved specimens. *annulatus*
  BB. Primaries 102–118; brown and white in preserved specimens. *paulensis*

AA. Small species; unicolor.
  B. Primaries 95–104 .... *hardyi*
  BB. Primaries 108–112 .... *insulanus*
  BBB. Primaries 120–133 .... *brasiliensis*

Remarks. *S. paulensis* occurs within the range of *annulatus,* and occupies dry regions back of the coast range.

S. insulanus, which is intermediate between *hardyi* and *brasiliensis,* is an insular form, while the two more extreme mainland forms may occur together.

I have examined 253 specimens of Siphonops, and these include the types of *annulatus, crassus, paulensis,* and *hardyi.* I have not been able to examine the types of *interrupta, brasiliensis, insulanus, maculatus,* or *marmoratus.*

Siphonops annulatus (Mikan)

1820. *Caecilia annulata* Mikan, Delect. Flor. Faun. Bras., pl. 11; 1924 Spix, Serp. Bras., p. 74, pl. 26, f. 1; 1829 Cuvier, Regne Anim. (2), **2**, p. 100; 1831 Gray, in Griffith's Cuvier's Anim. King. **9**, App., 110.

1828. *Siphonops annulatus* Wagler, Isis **21**, p. 742, pl. 10, f. 1, 2; 1830, Nat. Syst. Amphib., p. 198; 1838 Tschudi, Mem. Soc. Sci. Nat. Neuchatel **2**, p. 90; 1841 Duméril and Bibron, Erp. Gen. **8**, p. 282, pl. 85, f. 1; 1863 Duméril, Mem. Soc. Sci. Nat. Cherbourg **9**, p. 317, pl. 1, f. 2; 1868 Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 118; 1879 Peters, Mon. Ak. Berlin, p. 940, f. 10; 1879 Wiedersheim, Anat. Gym. pl. 1, f. 1–13, pl. 2, f. 27, 32–34, pl. 3, f. 37–44, pl. 7, f. 82, pl. 9, f. 83; 1882 Boulenger, Cat. Bat. Grad. Brit. Mus. (2), p. 102, pl. 8, f. 4; 1889 Cope, Bull. U. S. Nat. Mus. **34**, pl. 53, f. 1, pl. 56, f. 3; 1892 Boettger, Kat. Amph. Mus. Senckenberg. p. 62; 1895 Boulenger, Proc. Zool. Soc. London, p. 412; 1899 Goeldi, Zool. Jarhb. Syst. **12**, p. 120, pl. 9, f. 1–4; 1911 Ihering, Rev. Mus. Paulista **8**, p. 108, f. 1, 2, 3, 6, 7; 1912 Phisalix, Cong. Int. Zool **8** (Graz), pl. 4, f. 5 (integ.); 1913 Nieden, Gymno., p. 25, f. 1; 1915 Spengel, Blatt. Aq. Terr. **26**, p. 220; 1927 Muller, Abh. Senckenberg. Mus. **40**, p. 260; 1936 Sawaya, Rev. biol. hyg. (2) **7**, p. 80, pl. 7; 1937 Bull. Univ. São Paulo **1**, Zool. 1, pl. 30, f. 1–2, pl. 32, f. 13–15.

1829. *Caecilia interrupta* Cuvier, Reg. Anim. (2), **2**, p. 100.

1863. *Siphonops indistinctus* Duméril, Mem. Soc. Sci. Nat. Cherbourg **9**, p. 318 (in part, the dried specimen).

1885. *Dermophis crassus* Cope, Proc. Amer. Phil. Soc. **22**, p. 184 (upper Beni R., Bolivia).

1937. *Siphonops annulatus marmoratus* Sawaya, Bull. Univ. São Paulo **1**, Zool. 1, p. 238, pl. 30, f. 4–5; pl. 31, f. 7 (Theresopolis, Rio de Janeiro, Brazil).

Type. Paris 15.

Type locality. Sebastianopolis, Brazil.

Range. From "Argentina or Paraguay" and Rio Grande do Sul,

Brazil, to Bolivia, Guiana, Venezuela, and the eastern part of Peru, Ecuador, and Colombia. Upper Cauca River, Colombia.

Diagnosis. A Siphonops with white primary grooves; eye distinct; primaries 81–100; 1/d 16–43; length 126–535 mm.

Variation. In Mus. Nac. Brazil 831, from Theresopolis, Rio de Janeiro, the tentacle is slightly nearer the nostril than the eye, the snout is unusually long, and the hind end of the body is acuminate. In six from Serra de Maché, Rio de Janeiro, Mus. Paul. 940 A-E, and in one from "Brazil," Paris 17, the tentacle is almost equidistant between eye and nostril. In proportions and primary count these specimens do not differ from others which have the tentacle in the normal position closer to the eye.

The primary count ranges from 85 to 95 in 171 specimens (160 seen and 11 reported). Six specimens (four seen and two reported) have 81–84, and these are all from the southern part of the range. Seven specimens (five seen and two reported) have 96–100, and five of these are from the western and northern parts of the range.

The majority of the measured specimens (79) have the 1/d ratio from 20–30. The 20 stouter specimens ((1/d 16–19) include the five smallest and three of the twelve largest; and seven out of eleven Colombian specimens. The seven slim specimens (33–43) are all from the south, and the slimmest is dried somewhat.

Remarks. Sawaya's *marmoratus* is a color variety, not a geographical race.

Goeldi (1899) says it lives by preference in dry localities. He speaks of a female found rolled up under an old stump in a very dry place at Colonia Alpina, near Theresopolis, in the Organ Mts., Rio de Janeiro. In the middle of the coil was a clump of six eggs, in a continuous string, from each end of which there was a free, thread-like, projection. The eggs measured 10 by 8.5 mm. The contained embryos were 4 mm. in diameter, with two external gills on the left side and three on the right. The find was made in December.

Sawaya (1936) speaks of this species being eaten by the snake *Pseudoboa clelia.*

The only close ally is *paulensis.* The two are known to occur together in two localities. *S. annulatus* has a vastly wider range, which practically encloses that of *paulensis.*

Specimens seen, 175, as follows:

	prim.	length	diam.	1/d
Argentina or Paraguay:				
No locality, Hamburg 1064	87	175	5	35

	prim.	length	diam.	1/d
Brazil:				
Santa Catharina, Joinville, Vienna	87	—	—	—
Joinville AMNH 23693	88	322	15	21
	prim.	length	diam.	1/d
São Paulo,				
Taubaté, Mus. Paul. 942	86	278	14	20
Franca " 953	95	400	24	17
Interior MCZ 10782	93	201	7	29
No locality				
Hamburg 911–912	85 (4)			
(35 spec.)	86 (4)			
	87 (5)			
"	88 (7)			
	90 (8)			
	91 (5)			
"	92 (2)			
AMNH 23470	86			
23471	86			
23472	86	335		
" 23473	90	350		
23474	87			
23475	88	275	7	39
23476	87			
" 23477	86			
Berlin 5968	—	—	—	—
Munich 140/1912	87	185	9	20
Rio de Janeiro:				
No locality				
MCZ 290	92	375	14	27
" 328	84	310	17	19
Berlin 3704	91	405	12	34
Krakau 14671	94	—	—	—
" "	92	—	—	—
BMNH 74-5-21-7	89	325	13	25
AMNH 23503	84	327	18	18
Serra de Macahé,				
Mus. Paul. 940	85	242	10	24
940A	82	179	9	19
" 940B	85	185	9	20
940C	85	253	12	21

	prim.	length	diam.	1/d
Mus. Paul. 940D	86	225	10	22
940E	91	378	14	27
Petropolis				
Vienna	86	—	—	—
MCZ 2481	88	145	9	16
" "	85	205	13	16
Munich 140/1912	83	—	—	—
" "	89	325	13	25
Theresopolis				
Munich	93	350	17.5	20
Mus. Nac. Brazil 540	93	290	11	26
" " " 831	91	305	13	23
Neu Friburgo				
Hamburg 1093	94	320	15	21
USNM	89	—	—	—
USNM	87	—	—	—
USNM	92	—	—	—
USNM	88	—	—	—
Espiritu Santo:				
Sta. Tereza, 700 m.				
Mus. Nac. Brazil 842	91	370	18	21
Sta. Tereza, 760 m.,				
Mus. Nac. Brazil 843	92	147	8	18
Pau Gigante, Mus. Nac.				
Brazil 847	88	295	16	18
No locality				
Hamburg 1353	90	350	11	33
" "	89	171	6	28
Frankfort 21026	89	—	—	—
Berlin 14043	87	385	10	38
Vienna	89	160	6	26
"	91	190	8	23
"	93	395	14	28
"	89	355	15	24
"	91	350	15	23
Mts. between Espiritu Santo and Minas Garaes,				
Hamburg 1354	93	360	12	30
" "	91	300	9	33

	prim.	length	diam.	l/d
Hamburg 1354	94	245	9	27
" "	90	210	8	28
" "	90	178	8	22
" "	93	165	5.5	30
Minas Geraes,				
Mendez, on Rio Jequitinhonha,				
Vienna	92	—	—	—
Bahia.				
No locality,				
MCZ 1528	95	367	16	23
AMNH 18668	88	356	14	25
" 23502	93	283	16	18
Vienna	93			
"	90			
Berlin 9526	93	315	11	29
Hamburg 1355	92	382	13	29
Paris 15e	100	157	7	22
BMNH 61-3-23-20	92			
" 62-1-30-62	91	171	7	24
" 69-2-22-6	95	225	9	25
" 1924-9-20-0	93	210	10	21
Amazonas, Tabatinga,				
Vienna	97	—	—	—
Lagoa Japaranão, near Teffé				
MCZ 1520	88	360	16	22
? State?				
Tozuzu,				
Berlin 7169	95	128	6	21
Brazil, no locality:				
Paris 15	86	—	—	—
" 15d	94	450	24	Type 19
" 17	91	261	6	43 dry
AMNH 23501	84	284	13	22
Hamburg 1094	90	323	13	24
Frankfort 2102a	89	—	—	—
" "	88	364	17.5	20
USNM 58749	93	190	18.5	22

	prim.	length	diam.	l/d
Bolivia:				
Near Riberalta AMNH 15000	93	—	—	—
Upper Beni R.				
MCZ 6636	98	300	12	25
		cotype *Dermophis crassus*		
ANS 11344	94	348	13	27
		cotype *Dermophis crassus*		
Peru:				
No locality				
ANS 11346	92	420	17	25
		cotype Dermophis crassus		
Moyabamba				
BMNH 74-8-4, 5	94	425	18	24
" 74-8-4, 6	94	385	16	24
Iquitos, AMNH 42850	94	420	21	20
E. of Contamna, Peru Brazil frontier				
AMNH 42835	94	280	11	25
San Antonio, Rio Itaya				
AMNH 42842	91	337	13	26
" 42843	92	378	17	23
" 42844	92	310	13	24
" 42845	91	413	15	21
" 42846	93	380	15	25
" 42847	91	410	18	23
" 42848	90	380	16	24
" 42849	89	263	11	24
Pampa Hermosa, middle Ucayali, mouth of Cushatabay				
AMNH 42838	96	185	7	26
" 42839	93	300	14	21
Rio Cenipa, upper Marañon				
AMNH 42836	89	295	13	23
" 42837	90	225	10	22
Mouth of Santiago, upper Marañon				
AMNH 42833	89	280	11	25
" 42834	93	425	17	25
Ecuador:				
Sarayacu U. Michigan 89460	91	—	—	—
BMNH	92	148	9	16

	prim.	length	diam.	1/d
Pastaza R. (Canelos to Marañon R.)				
MCZ	90	160	9	18
"	87	245	13	19
"	90	290	14	21
"	91	385	13	30
"	92	345	14	25
"	93	—	—	—
"	96	—	—	—
"	94	375	19	20
"	90	360	17	21
"	91	345	18	20
No locality				
Berlin 9814	94	200	10	20
AMNH 17448	87	535	20	27
U. Michigan (5)	—	—	—	—
Colombia:				
Villavicencio Inst. La Salle	93	126	7	18
" " "	89	290	18	16
AMNH 23270	85	355	19	19
" 23171	91	415	20	21
Medina Mts., N. E. of Villavicencio				
AMNH 49955	95	365	15	24
" 49956	94	340	15	23
" 49957	91	347	18	19
" 49958	92	257	13	20
Guaicaramo				
AMNH 23384	92	430	23	19
" 23385	87	144	8	18
" 23386	85	171	10	17
Cayenne:				
No locality, Paris 15c	86	—	—	—
Surinam:				
No locality, Paris 15b	90	—	—	—

	prim.	length	diam.	1/d
Venezuela:				
Barinas, Zamora Prov., Munich	94	320	12	27
South America:				
No locality AMNH 49975	91	336	15	22

Besides the localities listed above, Ihering (1911) has recorded *annulatus* from the following places in Brazil: Rio Doce, Espiritu Santo; Pelotas, Rio Grande do Sul; the State of Matto Grosso. Spengel (1915) records it from Para.

Siphonops paulensis Boettger

1892. *Siphonops paulensis boettger*, Kat. Batr. Mus. Senckenbergianum. p. 62; Boulenger 1896. Proc. Zool. Soc. London, p. 412; Ihering 1911. Rev. Mus. Paulista **8**, pp. 91, 92, 109; Nieden 1913. Gymnopiona, p. 25; Serié 1918–19, Physis, **4, 17**, p. 361; Sawaya 1937, Bull Univ. São Paulo **1**, Zool. 1, p. 238, pl. 31, f. 11.

1937. *Siphonops paulensis maculatus* Sawaya, Bull, Univ. São Paulo, **1**, Zool. 1, p. 240 (Theresopolis, Rio de Janeiro, Brazil).

Type. Mus. Senck. 2102, 1b.

Type locality. São Paulo, Brazil.

Range. States of Rio Grande do Norte, Goyaz, Matto Grosso, Rio de Janeiro, and São Paulo, Brazil; Villarica, Paraguay; Sta. Cruz. and Buenavista, Bolivia; San Ignacio, Missiones, Argentina.

Diagnosis. A Siphonops with white primary grooves; primaries 102–118; 1/d 22–39; tentacle anterior to and a little below eye; eye distinct; length 139 to 480 mm.

Description. Boettger described *paulensis* as slimmer than *annulatus;* with more primaries; smaller head; different tentacle position; different color.

Eight specimens under 300 mm. in length have the 1/d ratio 22–28; sixteen between 300–350 have it 23–38; eleven between 350–400 have it 25–38; nine over 400 have it 27–39. Forty-two *annulatus* from the south have it 16–39, six above 30. This character is not diagnostic. Boettger gives an 1/d of 32 for *paulensis*.

Boettger gives a range of primaries of 110–115. Ihering says 20 São Paulo specimens had 114–116, except for one with 111. I count 106–117 on eighteen São Paulo specimens and 104–110 on seven from Goyaz.

Nine from Paraguay have 104–116; seven from Bolivia have 102–113. The maximum count in southern *annulatus* is 96, the minimum 81.

Sawaya (1937) has recorded a maximum of 118 for *paulensis*.

The primaries are interrupted dorsally in some of the Paraguay series.

Preserved specimens are brown, while *annulatus* is black.

The size of the head I cannot see to be different from that of *annulatus*.

The position of the tentacle seems to me to be exactly that of *annulatus*, with the exception that some *annulatus* have it quite far from the eye.

The number of rings is the best differentiating character, but since three *annulatus* from Bahia, Upper Beni R., and Tabatinga, have 100, 98, and 97 annuli respectively, this difference may be very slight.

Habits. Ihering (1911) says it is the commonest species in the environs of São Paulo City, is found in "dry places such as the range of Ypiranga," lives in ant hills but does not eat the insects, and has had the egg capsule of a spider in its stomach.

Remarks. Its only ally is *annulatus*, to which it is remarkably close. Both occur in the states of São Paulo and Matto Grosso, and in Paraguay and Bolivia. The only *locality* from which I have seen both is Taubaté in São Paulo. The two specimens recorded from there were approximately of the same proportions; *annulatus* 278/14 = 19.8; *paulensis* 286/13 = 22. The *annulatus* had 86 primaries; the *paulensis* 109. Both are reported by Sawaya from Theresopolis, Rio de Janeiro. *Paulensis* seems to be more an inhabitant of the high interior, although its range seems to be completely surrounded by the range of *annulatus*. The range has a remarkable similarity to that of *Cnemidophorus ocellatus*, and it is probable that it inhabits the savanna country which stretches back of the coast from Rio Grande do Norte southwest to São Paulo.

Sawaya's *maculatus* is not a race but a variety, as it is an occasional occurrence in the midst of normal *paulensis*.

Specimens seen, 44, as follows:

Brazil:	prim.	length	diam.	l/d
São Paulo:				
Taubaté, Mus. Paul. 1013	109	286	13	22
Ypiranga " " 939	112	398	16	25
" " " 947	110	363	13	28
" " " 947A	114	360	16	22

	prim.	length	diam.	l/d
Ypiranga Mus. Paul. 947B	114	380	11	34
" " " 949	110	317	13	24
" " " 949A	114	334	13	26
" " " 951	106	326	14	23
" " " 951A	108	341	9	38
" " " 951B	110	330	13	25
" " " 956	117	303	12	25
" " " 956A	112	227	11	24
São Paulo AMNH 23624	111	373	12	31
Frankfort 2102, 1a	115	418	13	32
2102, 1b	110	340	12	28 TYPE
2102, 1c	115	380	10	38
BMNH 94–7–25, 9	111	420	12	35
Munich 283/1920	111	330	10	33
Matto Grosso:				
Corumba BMNH 92–4–20, 23	109	190	7	27
Goyaz:				
Annapolis, 1000 m.,				
AMNH 43855	106	470	15	31
43856	105	440	15	29
43858	106	139	5	28
43859	104	455	17	27♂
43860	110	480	13	37
43861	108	362	14	26
43862	106	153	6	25
Rio Grande do Norte:				
Ceara Mirim, Cal. Acad. Sci. 49897	113	290	12	24
Paraguay:				
Villarica AMNH 19920	116	395	16	25
19921	115	380	13	29
19922	116	358	13	27
19923	115	314	12	26
19924	113	398	13	31
19925	107	304	10	30
19926	116	305	10	30
19927	115	340	12	28
No locality AMNH 23433	104	461	16	39

	prim.	length	diam.	l/d
Bolivia:				
Sta.Cruz. 500 m., Carnegie 11598	108	217	9	24
" " " 11599	106	166	7	24
" " " 2643	102	302	9	33
Buenavista BMNH 1927-8-1, 135	105	332	10	33
" " " 136	113	435	15	29
" " " 137	109	328	9	36
" " " 138	110	317	9	35
No data.				
Berlin 4	112	450	13	34

Ihering (1911) has recorded a specimen in the Museu Paulista from Raiz de Serra, São Paulo. Sawaya (1937) has recorded *paulensis* from Theresopolis, Rio de Janeiro, Brazil. Serié (1918–19) has recorded *paulensis* from San Ignacio, Missiones, Argentina.

Siphonops hardyi Boulenger

1888. *Siphonops hardyi* Boulenger, Ann. Mag. Nat. Hist. (6), **1**, p. 189; 1891, Ann. Mag. Nat. Hist. (6), **8**, p. 457; 1895, Proc. Zool. Soc. London, p. 412, pl. 24, f. 3; Ihering 1911, Rev. Mus. Paulista, **8**, p. 109; Nieden 1913, Gymnophiona, p. 26.

Type. BMNH No. 87-12-29-39, collected by M. F. Hardy de Drénduf.

Type locality. Porto Real, Rio de Janeiro, Brazil.

Range. The states of Rio de Janeiro and São Paulo, Brazil, in mountains of the coast ranges.

Diagnosis. A Siphonops of uniform color; primaries 95–104; l/d 27–45; eye distinct; tentacle a little anterior to and below the eye; length 136–178 mm.

Description. "Teeth small, subequal"; "uniform blackish" (the Ypiranga specimen is gray, lighter below); tentacle very near eye; primaries complete; Ihering gives 100 primaries for a specimen from Ypiranga, and 95 for one from Serra de Macahé. Boulenger (1895) says "eye more or less distinct"; and "tentacle close to and very slightly below eye."

Habits. Not known.

Remarks. This is the shortest species of the *hardyi-insulanus-brasiliensis* group. The proportions are much the same in all three, the tentacle position is not diagnostic, although Boulenger (1891) states

that the tentacle is closer to the eye in *hardyi* than it is in *brasiliensis*. The only real differences between the three are the number of primaries. The maximum number in *hardyi* is 104, *insulanus* has 108–112, and *brasiliensis* has 120–133. Both *hardyi* and *insulanus* are quite small (max. length 178 mm., and 200 mm. respectively) while *brasiliensis* reaches a length of 312 mm.

Specimens seen, nine, as follows:

	prim.	length	diam.	l/d
Rio de Janeiro:				
Porto Real				
BMNH no. 87-12-29-39	104	145	4	36 TYPE
" 91-6-16-14	102	150	4	37
" 91-6-16-15	100	145	4	36
Mambucaba, Mus. Nac. Brazil 841	103	136	3	45
Organ Mts. BMNH 1902-11-25-11	97	178	5.5	32
Tijuca, Fed. Dist. M. C. Z. 24954				
Serra de Macahé	95	152	4	38
Mus. Paul 962	99	160	6	27
" 962A	97	174	6	29
São Paulo:				
Ypiranga				
Mus. Paul. 944	96	170	5	34

Siphonops insulanus Ihering

1911. *Siphonops insulanus* Ihering, Rev. Mus. Paulista, **8**, p. 109; Nieden 1913, Gymnophiona, p. 26.

Type. In Museu Paulista, not seen.

Type locality. I. Victoria and I. São Sebastião, off coast of São Paulo, Brazil.

Range. Known only from the type localities.

Diagnosis. A Siphonops of uniform color, primaries 108–112; l/d 31–41; eye indistinct; tentacle a little anterior to and below the eye; length 152–200 mm.

Description. Little can be added to the diagnosis. Ihering says all the rings "are interrupted in the dorsal region and at times a little on the ventral line." The color is uniform light gray. The tentacle is very

close to the eye and a little below. Of the four specimens seen the eye was invisible in two. The primaries were interrupted dorsally in the middle of the body in one out of four. Ihering mentions a length of 200 mm., and a length-diameter ratio of 41.

Habits. Not known.

Remarks. Allied to *hardyi* and to *brasiliensis,* and apparently between the two.

Specimens seen, four, as follows:

	prim.	length	diam.	1/d
Isla Victoria:				
Mus. Paul 946	108	157	5	31
" 946A	110	194	5	39
			eye invisible	
" 946B	111	152	4	38
			eye invisible	
Isla S. Sebastião				
Mus. Paul. 945	112	162	4	40

Siphonops brasiliensis Lütken

1851. *Siphonops brasiliensis* Lütken, Vid. Meddel., p. 52; Reinhardt and Lütken 1861, Vid. Meddel. p. 202; Boulenger 1891, Ann. Mag. Nat. Hist. (6), **8**, p. 457; 1895, Proc. Zool. Soc. London, p. 412; Ihering 1911, Rev. Mus. Paulista, **8**, p. 110; Nieden 1913, Gymnophiona, p. 25; Parker and Wettstein 1929, Ann. Mag. Nat. Hist. (10), **4**, p. 594.

1879. *Dermophis ? brasiliensis* Peters, Mon. Ak. Berlin, p. 938.

Type. In Copenhagen Museum, collected by Langgaard. Not seen.

Type locality. Brazil.

Range. Known from the states of Santa Catharina, São Paulo, Minas Geraes, and Rio de Janeiro, Brazil.

Diagnosis. A Siphonops with uniform color; primaries 115–133; 1/d 31–54; tentacle somewhat anterior to and below the eye; eye indistinct; primaries frequently interrupted; length 167–312 mm.

Description. The original description gives 133 primaries; the 20 first and the last 13 complete; "gray"; 1/d 46. The eye may be distinct, indistinct, or invisible. The primaries may be mostly interrupted or all complete. There seems to be no change in proportions with age. Parker and Wettstein (1929) state that the premaxillary-maxillary teeth are 6–8 on a side; total 12 in the type.

Habits. Not known.

Remarks. The relationships of this set of species have been dealt with under *hardyi*. The two mainland forms occur together at Ypiranga, São Paulo, where *hardyi* has 96–100 primaries and *brasiliensis* has 122.

Specimens seen, 21, as follows:

	prim.	length	diam.	l/d
Santa Catharina:				
Colonia Hansa				
Hamburg 1807	124	213	5	43
Frankfort 2102, 1d	122	235	6.5	36
Joinville				
Vienna	124			
"	131			
Mus. Nac. Brazil 542	115	215	5	43 no eye
" " 840	125	235	6	39 no eye
São Paulo:				
Pernahyba				
Vienna	126			
"	127			
"	126			
Franca				
Mus. Paul. 960	130	217	6	36 prim. int.
Ypiranga				
Mus. Paul. 961	122♂	205	6	36 prim. comp.
Rio de Janeiro:				
Rio				
Paris 15 m.	120	190	4	47
Petropolis				
MCZ 24829	130	312	9	35
" 24826	129	167	5	33
South Brazil:				
Hamburg 1927	121	268	5	54
Hamburg 1927	121	268	7	39
" 1927	121	260	5	52
Brazil:				
Frankfort	121	265	8	44 eye indist.

	prim.	length	diam.	1/d
No locality:				
BMNH 98-6-27, 3	123	245	8	31
Vienna	122	247	6.5	38
			eye invisible	
Mus. Nac. Brazil 543	123	230	5	46
			eye invisible	

Ihering (1911) has recorded specimens in the Museu Paulista from Rio Fieo, São Paulo, and says it occurs in the State of Minas Geraes.

Note for identification: This animal has been confused with *Chthonerpeton viviparum* (q. v.). The Siphonops has: no inner mandibular teeth, the Chthonerpeton has 3–4; the tentacular aperture in the Siphonops is much closer to eye than to nostril, in the Chthonerpeton it is only slightly closer to eye than to nostril; the Siphonops has primaries 115–133, the Chthonerpeton has primaries 133–166; the Siphonops has a normal vent, the Chthonerpeton has a small sucking disk around the vent; the Siphonops is presumably oviparous, the Chthonerpeton is known to be viviparous.

Caecilia Linné

1758. *Caecilia* Linné, Syst. Nat. (10) **1**, p. 229 (included species *tentaculata* Linné and *glutinosa* Linné). Fitzinger (1843, Syst. Rept., p. 34) designated *C. lumbricoidea* [*lombricoidaea*] Daudin 1803 (=*C. gracilis* Shaw=*C. tentaculata* Linné in part) as type. Shaw in 1802 (Gen. Zool. **3**, 595) restricted *tentaculata* when describing *gracilis*, and I designate *tentaculata* Linné as restricted by him as type of *Caecilia*. Daudin's species was not in the content of the original genus.

1802. *Coecilia* Latreille, in Sonnini and Latreille, Hist. Rept. **4**, p. **237** (pro *Caecilia* Linné).

1901. *Amphiumophis* Werner, Abh. Mus. Dresden **9**, **2**, p. 14 (monotype *Amphiumophis andicola* Werner, l. c.).

Diagnosis. Caecilians without a tail; primaries 110–285; secondaries 0–94; scales usually present; 55–268 primary folds without secondaries; 1/d 26–160; snout projecting; tentacle in horseshoe-shaped groove on under surface of snout, below and slightly posterior to nostril; eye visible or invisible, in open orbit or roofed by bone; anterior teeth on both jaws enlarged, especially on lower; inner mandibular tooth row well developed to absent; length 126–1375 mm.; 16 forms.

Range. Coclé, Panamá, to Guayaquil, Ecuador, and Carabaya and Chanchomayo, Peru. The Guianas. Brazil. Sea level to 6200 feet.

Key to forms of Caecilia

A. Secondaries present.
  B. Primaries 110–150.
    C. Secondaries 38–83 . . . . *dunni*
    CC. Secondaries 12–37 . . . . *tentaculata*
    CCC. Secondaries 8 or less.
      D. Primaries 110–119 . . . . *guntheri*
      DD. Primaries 139–150 . . . . *abitaguae*
  BB. Primaries 154–285.
    C. Primary count minus secondary count plus 1/d ratio less than 282; primaries less than 239; 1/d ratio less than 94.
      D. No color markings.
        E. Secondaries 28–94.
          F. Primaries 185; 91 without secondaries . . . . . *armata*
          FF. Primaries 155–190; 108–138 without secondaries . . *nigricans*
          FFF. Primaries 187–238; at least 152 without secondaries *thompsoni*
        EE. Secondaries 8–25.
          F. Primaries 154–161 . . . . *subnigricans*
          FF. Primaries 185–214 . . . . *gracilis*
      DD. Color markings usually present.
        E. Eyes visible; usually a pair of yellow spots on each segment; primaries 154–199; secondaries 2–11 . . . . . . *pachynema*
        EE. Eyes invisible; gray with black primary grooves; secondaries 7–29.
          F. Primaries 171–192 . . . . *ochrocephala*
          FF. Primaries 204–209 . . . . *polyzona*
    CC. Primary count minus secondary count plus 1/d ratio more than 291; primaries over 205; 1/d ratio usually over 100 . . . . *bassleri*
AA. No secondaries.
  B. Primaries less than 200; eyes visible.
    C. Primaries less than 150.
      D. Primaries 110–119 . . . . *guntheri*
      DD. Primaries 125–139 . . . . *degenerata*
      DDD. Primaries 145–146 . . . . *caribea*
    CC. Primaries 154–199 . . . . *pachynema*
  BB. Primaries 226–231; eyes invisible . . . . *elongata*

Tabular list of counts of Caecilia

Specimens seen	species	primaries	secondaries	primaries minus secondaries	1/d
4	guntheri	110–119	0–8	110–119	27–31
27	tentaculata	112–147	12–37	79–133	22–52
63	degenerata	125–139	0	125–139	31–76
19	dunni	123–150	38–83	55–85	32–57
2	caribea	145–146	0	145–146	53–55
3	abitaguae	139–150	5–6	134–144	43–59
2	subnigricans	154–161	17–18	137–143	58–62
1	armata	185	94	91	56
19	nigricans	155–190	28–62	108–138	37–66
25	pachynema	154–199	0–11	154–199	37–84
101	ochrocephala	171–192	7–29	149–179	39–87
31	gracilis	185–214	8–25	167–193	48–93
2	polyzona	204–209	10–17	187–199	43–61
10	thompsoni	187–238	29–41	152–200	45–92
3	elongata	226–231	0	226–231	83–89
12	bassleri	206–285	14–41	174–268	80–160
324					

Caecilia by areas

Caecilia of Panamá

		prim.	sec.	1/d
1	tentaculata	131	12	28
99	ochrocephala	171–192	9–29	39–87
3	elongata	226–231	0	83–89

Caecilia of Atrato drainage, Colombia

		prim.	sec.	1/d
1	guntheri	119	0	29
2	dunni	132–133	50–61	32–35
1	nigricans	190	52	57
1	ochrocephala	185	23	50

Caecilia of Colombian Chocó

		prim.	sec.	1/d
2	guntheri	110–115	0	27
15	dunni	128–150	50–83	37–57
7	nigricans	159–188	36–47	37–58

		prim.	sec.	1/d
	Caecilia of Pacific slope of Ecuador			
1	guntheri	118	8	31
1	dunni	123	38	41
9	nigricans	155–180	28–62	42–66
3	bassleri	206–251	14–32	119–130
12	pachynema	158–183	0–10	40–81
	Caecilia of the Cauca Valley, Colombia			
1	caribea	145	0	55
2	pachynema	159–166	2–7	52–78
2	polyzona	204–209	10–17	43–61
1	thompsoni (?)	212	35	84
			(Rio Coqueta, Cauca Valley?)	
	Caecilia of Magdalena Valley, Colombia			
2	subnigricans	154–161	17–18	58–62
6	thompsoni	187–238	29–39	45–92
	Caecilia of Barranquilla and Santa Marta region, Colombia			
2	tentaculata	116–147	14–21	31–38
1	caribea	146	0	63
	Caecilia of the Colombian Oriente			
51	degenerata	128–139	0	31–76
2	tentaculata	113–146	29–31	31
1	thompsoni (?)	212	35	84
				(Rio Caqueta?)
1	bassleri	244	25	80
2	pachynema	156–180	0	38–54
	Caecilia of the Ecuadorian Oriente			
1	dunni	123	67	35
3	tentaculata	115–122	29–33	30–35
3	abitaguae	139–150	5–6	43–59
2	bassleri	254–271	28–41	124–160
1	pachynema	174	0	73
	Caecilia of the Peruvian Oriente			
2	tentaculata	120–129	28–31	36–39
1	gracilis	188	21	56
6	bassleri	230–285	17–30	80–124
4	pachynema	165–199	0–11	59–70

Caecilia of the Guianas

		prim.	sec.	1/d
13	tentaculata	112–146	13–37	27–52
25	gracilis	185–207	9–23	48–93

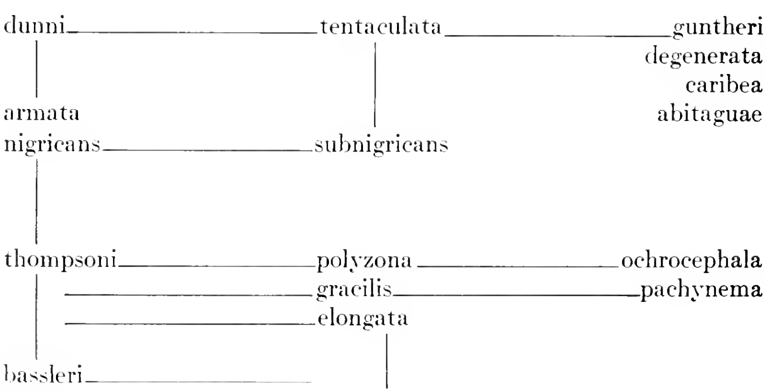
Caecilia of Brazil

1	tentaculata	130	15	46
1	armata	185	94	56
1	gracilis	214	25	92

This list by areas shows clearly that as many as five perfectly distinguishable forms may occur in a single geographical area. Colombia has twelve forms, Ecuador seven, Peru four, Panamá and Brazil three, and the Guianas two. No specimens of Caecilia have been seen or reported from Venezuela, but at least two (*tentaculata* and *gracilis*) must occur there.

Remarks. A diagram of the forms, with *dunni*, *nigricans*, and *armata*, *thompsoni*, and *bassleri* arranged in order of increasing number of primaries and increasing slimness, and with the other forms appended as they seem to fit, is given here as a possible scheme of relationships.

Two forms, *C. dunni* and *C. armata*, retain more of the scalation than do the others. *C. nigricans* is a close third. As *dunni* has a combination of few primaries and many secondaries it may be assumed to be the most primitive existing form. Other forms show: an increase in primaries; a decrease in secondaries; extreme attenuation; degeneration of the eye; a combination of these characters, and may be assumed to be more specialized.



The genus could, very plausibly, be regarded as monotypic with 16 races, so closely do allied forms resemble each other. But as many as five different forms may occur together and remain distinct, and at present it seems best to treat each recognizable form as a species. The difficulty of treating them in any other way may be illustrated by the fact that one can start with *nigricans* of the Chocó, and, by a series of easy transitions (via *subnigricans* of the Magdalena and *tentaculata* of the Oriente) arrive at *guntheri*, also of the Chocó. Also, in this set of forms, *dunni* is about as good an intermediate between *nigricans* and *tentaculata* and occurs with both, while *nigricans* itself is intermediate between the two forms of the Magdalena Valley, *subnigricans* and *thompsoni*. One could, perhaps consider *ochrocephala* and *polyzona* as races of a species, and the *guntheri-degenerata-abitaguae-caribea* set as races of another species.

Linné (1758) used the spelling Caecilia. The first occurrence of the emended spelling Coecilia that I have noted is Latreille (1802). There have been so many writings of the generic name in type which does not differentiate the diphthong "ae" from the diphthong "oe" that I have given up any attempt to differentiate between them in synonymies, and have used Caecilia throughout.

Cope, in 1885, put his *Caecilia ochrocephala* into the genus Herpele. I see no reason why *ochrocephala* should be placed in a different genus from *tentaculata* and *gracilis*. The West African *squalostoma*, the type of Herpele, has the tentacular aperture more posterior than any American species, and in it the anterior maxillary and dentary teeth are not enlarged. I do not consider *squalostoma* as congeneric with any American species.

The single specimen in Dresden upon which Werner, in 1901, founded his genus and species *Amphiumophis andicola*, is, in my opinion, conspecific with *Caecilia tentaculata*.

The following list contains described species which I think valid:

tentaculata Linné 1758.
gracilis Shaw 1802.
pachynema Günther 1859.
ochrocephala Cope 1866.
guntheri Peters 1879.
polyzona Fischer 1879.
nigricans Boulenger 1902.
thompsoni Boulenger 1902.
dunni Hershkovitz 1938.

I have examined the types of all of these except *tentaculata* and *gracilis*.

I have seen a specimen of *gracilis* which was so named by the describer of the species.

The following list contains described species which I regard as invalid. I have examined the types of all of these.

albiventris Daudin 1803 = *tentaculata.*
lombricoidaea Daudin 1803 = *gracilis.*
isthmica Cope 1877 = *tentaculata.*
buckleyi Boulenger 1884 = *pachynema.*
andicola Werner 1900 = *tentaculata.*
sabogae Barbour 1906 = *ochrocephala.*
intermedia Boulenger 1913 = *nigricans.*
palmeri Boulenger 1913 = *nigricans.*

The following names are substitutes:

ibiara Daudin 1803 for *tentaculata.*
vermiformis Gray 1850 for *gracilis.*

I describe hereinafter seven forms in addition to the nine recognized above as valid, making a total of 16 forms.

The most recent systematic treatment of these species is that of Nieden in "Gymnophiona" (1913). This is based on previous work by Boulenger. As my treatment differs very considerably, I should explain why. In the first place Boulenger was able to examine very little material aside from that in the British Museum. This contained, in 1929, 54 specimens of Caecilia, seven of them being the types of described forms; I have been able to examine 324 specimens and the types of 15 described forms. In the second place, Boulenger lumped primaries and secondaries together into one count, and thus a Caecilia with many vertebrae and few scales would appear statistically similar to one with few vertebrae and many scales. By keeping these two independent variables separate, I arrive at results which are frequently different from Boulenger's.

Caecilia dunni Hershkovitz

1913. *Caecilia intermedia* Boulenger (in part, numbers 5–6), Proc. Zool. Soc. London, p. 1020.

1913. *Caecilia nigricans* Boulenger, l. c., p. 1022 (not *C. nigricans* Boulenger 1902).

1938. *Caecilia dunni* Hershkovitz, Occ. Papers Mus. Zool. U. Michigan **370**, p. 2, f. 1.

Type. Mus. Zool. U. Michigan 82901, collected by Philip Hershkovitz, Dec. 1935.

Type locality. Near Tena, Province of Napo-Pastaza (Oriente) Ecuador, 1700 feet above sea level.

Range. Atrato Valley, Colombia; Colombian Chocó; Cachabé, northwest Ecuador; Tena, Ecuadorian Oriente. Sea level to 1700 feet.

Diagnosis. A Caecilia with 123-150 primaries; 38–83 secondaries; 55–85 primary folds without secondaries; 1/d 32/57; eye visible in most specimens; no markings; length 147–450 mm.

Description. The type has nine teeth in each of the long rows and two on each side in the inner mandibular row. The eye is invisible in the Cachabé specimen. There is some variation which may be geographic.

		Prim.	Sec.	1/d
1	E. Ecuador	123	67	35
1	N. W. Ecuador	123	38	41
15	Colombian Chocó	128–150	50–83	37–57
2	Atrato Valley	132–133	50–61	32–35

With more material the form might be divided.

Remarks. This form is allied only to *tentaculata*, from which it differs in having a higher secondary count. *C. tentaculata* is absent from the Pacific slope and from the Atrato Valley, but apparently occurs with *dunni* in the Oriente of Ecuador.

BMNH 1913–11–12, 134 from Peña Lisa was "taken from the stomach of a *Streptophorus atratus* swallowed by an *Elaps corallinus*" (Boulenger 1913).

Specimens seen 19, as follows:

Colombia:		prim.	sec.	length	diam.	1/d
Las Animas Cr., Quito R., Atrato system, AMNH 13678		133	61/6	290	9	32
Quibdo on Atrato, Inst. La Salle		132	50	210	6	35
Anda Goya, BMNH 1915–10–21,	73	133	78/15	188	5	38
	74	136	80/11	210	5.5	38
	75	142	64	147	4	37
	76	139	63/20	435	8	54
	77	136	77/26	300	6	50
	78	—	—	—	—	—
	79	—	—	—	—	—
1916–4–25,	31	131	65/4	409	9	45
	32	134	77/11	375	9	41
Peña Lisa, Condoto, 300′,						

		prim.		sec.	length	diam.	l/d
BMNH	1913-11-12,	134	146	67/8	280	6	56
		135	150	83/10	270	5	54
		136	147	62/8	395	7	57
	1914-5-21,	93	129	54/5	240	6	40
Condoto, BMNH	1910-7-11,	73	128	50/20	186	5	37
		74	146	78/21	350	5	50
Ecuador:							
Cachabé, BMNH	98-3-1,	36	123	38/6	290	7	41
Tena, U. Michigan 82901			123	67/5	450	13	35

Caecilia tentaculata Linné

1758. *Caecilia tentaculata* Linné (except reference to pl. 5, f. 2, Mus. Adolph, Frid.) Syst. Nat. (10), p. 229; Shaw 1802, Gen. Zool. **3**, 595; Latreille 1802, in Sonnini and Latreille, Hist Rept. **4**, p. 237, pl. 22, f. 2; Cuvier 1817, Regn. Anim. **2**, p. 87; Goldfuss 1820, Handb. Zool. **2**, p. 138; Merrem 1820, Vers. Syst. Amph., p. 168; Cuvier 1829, Regn. Anim. (2), **2**, p. 100; Gray 1831, in Griffith's Cuvier's Anim. King. **9**, App., p. 110; Gray 1850, Cat. Batr. Grad. Brit, Mus., p. 58; Peters 1879, Mon. Berlin Ak., p. 934, f. 5; Boulenger 1882, Cat., Batr. Grad. Brit. Mus. (2), p. 93; Boulenger 1895, Proc. Zool. Soc. London, p. 406; Phisalix 1912, Congr. Int. Zool. **8** (Graz 1910), pl. 4, f. 3, 8, 11 (integ.); Nieden 1913, Gymnophiona, p. 12, f. 3, 4, 10.

1838. *Caecilia lenticulata* Tschudi, Mem. Soc. Sci. Neufchatel **2**, p. 90 (typ. error)

1803. *Caecilia albiventris* Daudin, Nat. Hist. Rept. **7**, p. 423, pl. 92, f. 2 (Surinam, type Paris 9); Cuvier 1829, Regn. Anim. (2), **2**, p. 100; Gray 1831, in Griffith's Cuvier's Anim. King. **9**, App,, p. 119; Duméril and Bibron, 1841, Erp. Gen. **8**, p. 276, pl. 85, f. .3; Tschudi 1845, Faun. Peru. p. 80; Duméril 1863, Mem. Soc. Sci. Cherbourg **9**, p. 313, pl. 1, f. 1, 9.

1820. *Caecilia albiuentris* Merrem, Syst. Amph., p. 169 (emendation).

1803. *Caecilia ibiara* Daudin, Nat. Hist. Rept. **7**, p. 427 (substitute for *tentaculata* Linné).

1877. *Caecilia isthmica* Cope, Proc. Amer. Phil. Soc. **17**, p. 91 (Atlantic side isthmus of Darien, type USNM 25188); Dunn 1928, Proc. New England Zoöl. Club **10**, p. 73.

1900. *Amphiumophis andicola* Werner, Abh. Mus. Dresden (2), p. 14 (Chanchamayo, Peru, type Dresden 1689).

Type. Not known to exist.

Type locality. "America" = Surinam (cf. Amoen. Acad. 1, p. 498, pl. 17, f. 1, Linné, 1749).

Range. Darien to Brazil and to eastern Peru. Sea level to 2800 feet.

Diagnosis. A Caecilia with 112–147 primaries; 12–37 secondaries; 79–133 primary folds without secondaries; eye usually visible; 1/d 22–52; length 126–1075 mm.; belly usually with white blotches.

Description. Boulenger (1882) gives the dentition of the Shaw specimen as "teeth moderately large; on each side . . . . . . maxillaries 6 to 8, vomero-palatines 5, outer mandibulars 6 or 7, inner mandibulars very small, few." The type of *andicola* has no inner mandibular teeth. The three specimens from Demarara and Mazaruni River have no visible eyes. White blotches are present on the bellies of most Guiana specimens irrespective of the primary count. The diagnosis above could have been made out entirely from Guiana specimens save for one more primary in a Colombian specimen, one less secondary in the type of *isthmica*, and for a stouter Ecuadorian specimen.

Remarks. Linné first mentioned this form in 1749 (Amoen. Acad. 1, p. 498, pl. 17, f. 1) as from Surinam and as having 135 rings. in 1754 (Mus. Adolph. Frid., p. 19) he abbreviates his 1749 description, and adds a figure (pl. 5, f. 2) of a much slimmer animal (*gracilis* of this paper). His 1758 description is very brief. In it he refers to his two previous papers, citing the former as page 489, a mistake that has been widely copied.

There is a rather wide range of variation, and possibly this species is composite, especially as the Guiana specimens are easily separable into two sets. I therefore list possible divisions.

1. low primary, low secondary, stout.

116	14	1/d 38	A single Colombian.

2. low primary, high secondary, stout.

112–129	24–37	22–39	This includes 19 specimens, 10 Guianan (type of *albiventris*), one Colombian, four Ecuadorian, two Peruvian (type of *andicola*), two without data.

3. high primary, low secondary, stout.

131–147	12–21	28–31	First numbers in each case are the Panamanian type of *isthmica*; second numbers a Colombian specimen.

4. high primary, low secondary, slim.

130–146	13–15	44–52	This includes three Guiana specimens and the Brazilian one. The type of *tentaculata* probably belonged here.

5. high primary, high secondary, slim.

146	29	40	A single Colombian specimen.

2 and 4 occur together in Guiana; 1 and 3 occur together in northern Colombia; 2 and 5 occur together in the Colombian Oriente. Additional material may in time afford some clarification of this puzzle, but I do not wish to divide the 27 specimens into five species under the existing conditions of knowledge.

The series as a whole has fewer secondaries than *dunni*, and more secondaries than the *guntheri-degenerata-caribea-abitaguae* series which, with *tentaculata*, comprise those Caecilia with less than 151 primaries. *C. tentaculata* occurs with *degenerata* at Garagoa in the Colombian Oriente, near *dunni* aod *abitaguae* in the Ecuadorian Oriente, and near *caribea* in northern Colombia.

Specimens seen, 27, as follows:

			prim.	sec.	length	diam.	l/d
Panamá:							
Atlantic side Darien							
	USNM	25188	131	12/0	570	20	28
Colombia:							
Rio Frio	MCZ	17376	147	21/0	330	8	31
Sabana arga	AMNH	14032	116	14	430	15	38
Garagoa	MCZ	17384	146	29/0	260	6.5	40
Pto. Asís, R. Putomayo							
Inst. La Salle			113	31/0	470	15	31
British Guiana:							
Marudi Mts.	AMNH	49470	121	37	126	4	31
		49471	121	26	145	5	29
		49472	120	33	135	5	27
		49473	120	34	140	5	28
		49474	119	34	128	4	32
		49475	115	29	442	13	34
do	do	49476	119	27	205	7	29
Demarara	BMNH						
	89–9–30,	16	136	13/3	313	6	52

		prim.	sec.	length	diam.	1/d
Kamakusa	AMNH 49962	112	33	500	15	33
Mazaruni R.	AMNH 20079	146	15/5	307	7	44
	20080	146	13/5	340	7	48
Dutch Guiana:						
Surinam	Paris 9	120	29	600	18	33
do	BMNH 58-6-1, 36	120	24/4	350	10	35
Brazil:						
No data	Hamburg 1717	130	15/8	502	11	46
Eastern Ecuador:						
Tuvola, 2800′	AMNH 23421	115	29/0	275	9	30
Copatava R.	AMNH 49961	122	29/2	640	18	35
Rio Suno 300′	Mich.	121	32/5	155	7	22
No data	Mich. 89459	121	33/4	1075	30	36
Eastern Peru:						
Chanchamayo	Dresden 1689	129	28/4	350	9	39
Monte Alegre, R. Pachitea 750–1000′	AMNH 42855	120	31/2	365	10	36
South America:						
No data	Berlin 3901	115	31/4	565	15	37
No data:						
Shaw coll.	BMNH 1929-5-16, 1	114	28/4	510	19	27

Tschudi (1845) records *tentaculata* from Vitoc in middle Peru. He says that the young have gill slits.

The measurement of length in the giant Ecuadorian specimen is purely approximate. It could be stretched to 960 mm.; using a string it measured 1190 mm.

Caecilia degenerata spec. nov.

Type. MCZ 17384.

Type locality. Garagoa, eastern Colombia.

Range. Eastern Colombia.

Diagnosis. A Caecilia without secondaries; primaries 125–139; 1/d 31–76; length 132–555 mm.

Description. The primaries have been counted in 48 specimens. Of these 35 came from either Choachi or Tomaque, nearby localities in the

Oriente of Colombia. The range of these 35 is 128–139, and only three specimens are outside the range of 130–138. Specimens from elsewhere have similar counts except the Rio de Pache specimen with 125 primaries. The primaries are interrupted dorsally and ventrally (AMNH 22584–6, 22588–92).

The length-diameter ratio has been computed for 51 specimens. The range is 31–76 in 40 Choachi and Tomaque specimens. The larger animals seem to be slightly slimmer, since for the same 40 specimens the highest ratio below a length of 300 mm. is 45, and the lowest above a length of 400 mm. is 37. For these two places the four ratios above 60 are for animals of 362 mm. long and over, and the ratios below 35 are for animals of 300 mm. long and under. The Rio de Pache specimens is in contrast to this with a ratio of 31 (as stout as any) and a length of 525 mm.

The Rio de Pache specimen has yellow spotting laterally; 5–6 maxillary-premaxillary teeth on a side; 9 palatine teeth; 8 left mandibular teeth with the four first enlarged; 6 right mandibular teeth with the two first enlarged; 3–4 inner mandibular teeth; the eye definitely visible. A Choachi specimen has two inner mandibular teeth.

Remarks. The large series from Choachi and Tomaque, in the American Museum, gives the range of variation and the characters. The specimens from "Colombia," "Bogotá," and Garagoa are within this range of variation.

The specimen from Rio de Pache is so close in primary count that it is best placed here. I have not been able to place the locality. It was from one of Eigenmann's collections, and no data save "Rio de Pache, Porte" were with it. The University of Michigan staff, Dr. Barbour, Dr. Chapman, and myself, have been unable to find the Rio de Pache, Porte. Barbour suggested that it is Lima, near Peru, which would complicate the situation considerably.

Scales are definitely not present in the Garagoa specimen, the Rio de Pache specimen, AMNH 23355 from Colombia, the La Salle one from Choachi, and AMNH 23270 from Choachi. They are present in AMNH 23271 from Choachi.

Specimens seen, 63, as follows:

			prim.	length	diam.	l/d
Colombia:						
Choachi	AMNH	23259	131	384	9	42
		23260	132	326	9	36
		23261	133	400	10	40

			prim.	length	diam.	1/d
Choachi	AMNH	23262	—	398	8	50
		23263	136	425	8	54
		23264	—	—	—	—
"	"	23265	—	443	8	55
		23266	—	415	10	41
		23267	131	441	9	49
"	"	23268	—	378	9	42
		23269	—	—	—	—
Choachi	AMNH	23270	—	—	—	—
		23271	—	—	—	—
		23272	134	451	8	58
"	"	23273	138	367	10	37
		23274	131	360	10	36
Choachi, Inst. La Salle			135	390	8	49
Choachi and Tomaque	AMNH	22560	138	—	—	—
		22561	—	—	—	—
		22562	—	—	—	—
"	"	22563	139	512	11	46
		22564	133	550	13	42
		22565	—	—	—	—
"	"	22566	136	466	12	39
		22567	138	450	12	37
		22568	136	467	8	58
"	"	22569	—	406	9	45
		22570	130	380	8	47
		22571	136	433	8	54
"	"	22572	135	153	5	31
		22573	134	260	7	37
		22574	129	400	9	44
"	"	22575	130	321	8	40
		22576	137	455	6	76
		22577	130	132	4	33
"	"	22578	134	365	8	45
"	"	22579	135	213	6	35
		22580	—	420	7	60
		22581	131	408	8	51
		22582	—	—	—	—

			prim.	length	diam.	1/d
Choachi and Tomaque	AMNH	22583	136	182	4	45
		22584	134	380	10	38
		22585	134	300	9	33
		22586	135	485	8	60
		22587	134	154	4	38
		22588	128	445	9	49
		22589	132	362	6	60
		22590	138	555	10	55
		22591	138	555	10	55
		22592	130	350	10	35
Garagoa	MCZ	17383	134	470	10	47
? Bogotá	AMNH	23421	132	450	10	45
no locality	AMNH	23348	132	380	7	54
		23349	137	—	—	—
		23350	136	470	10	47
		23351	135	352	9	40
		23352	134	—	—	—
		23353	127	298	7	42
		23354	133	335	9	37
		23355	137	400	8	40
		23356	138	159	5	32
no locality	AMNH	34254	133	373	9	52
??? Rio de Pache, Porte	U. Mich.	65263	125	520	17	31

Caecilia abitaguae spec. nov.

Type. Mus. Univ. Michigan 89930.

Type locality. Abitagua, Oriente, Ecuador, 1100 m. elevation.

Range. Known only from type locality.

Diagnosis. A Caecilia with 139–150 primaries; secondaries 5–6; 1/d 43–59; length 300–1200 mm.; eye visible; no markings.

Description. Nothing of importance can be added to the diagnosis and the characters of the individual specimens.

Remarks. This form is close to *degenerata* of the Colombian Oriente, but these Ecuadorian specimens have a higher primary count, and all three have a few secondaries. It is also related to *C. guntheri* of western Ecuador, but has a much higher primary count, and is somewhat

slimmer. It is extremely similar to *C. caribea* of northern Colombia, differing only in having secondaries.

It occurs with *C. tentaculata* in the Oriente of Ecuador, but *tentaculata* has at least 17 fewer primaries and 23 more secondaries in the region where the two are together.

Specimens seen, 3, as follows:

			prim.	sec.	length	diam.	1/d
Ecuador, Oriente:							
Abitagua	Mich.	89929	150	6	1200	22	59
"	"	89930	145	6	780	18	55
"	Stanford	5061	139	5	300	8	43

CAECILIA CARIBEA spec. nov.

Type. MCZ 24520.

Type locality. Pensilvania (Cauca valley south of Medellin), Colombia.

Range. Known only from type locality and from Barranquilla, Colombia.

Diagnosis. A Caecilia with 145–146 primaries; no secondaries; eye visible; 1/d 53–55; no distinctive markings; length 390–585 mm.

Description. Nothing can be added to the diagnosis and the characters of the individual specimens.

Remarks. This form is similar to *degenerata* of the Colombian Oriente, to *abitaguae* of the Ecuadorian Oriente, and to *guntheri* of the Atrato valley and the Pacific coast. Strangely enough, it is most similar to *abitaguae*, differing only in lacking secondaries. It has a higher primary count than *degenerata* and a much higher one than *guntheri*.

C. caribea occurs with *C. tentaculata* in northern Colombia, but *tentaculata* there has 14–21 secondaries and a length-diameter ratio of 31–38.

Specimens seen, 2, as follows:

			prim.	length	diam.	1/d
Colombia:						
Pensilvania	MCZ	24520	145	390	7	55
Barranquilla	Senckenberg	3095a	146	585	11	53

CAECILIA GUNTHERI Peters

1859. *Caecilia rostrata* Günther, Proc. Zool. Soc. London, p. 417 (not *Caecilia rostrata* Cuvier = *Hypogeophis rostratus*).

1879. *Caecilia guntheri* Peters, Mon. Berlin Ak., p. 936 (substitute name).

1880. ?*Caecilia pachynema* Boulenger, Bull. Soc. Zool. France **5**, p. 48 (two specimens in Brussels from "Andes of Ecuador," not *C. pachynema* Günther).

1882. *Caecilia isthmica* Boulenger (at least in part) Cat. Batr. Grad. Brit. Mus. (2), p. 94, pl. 6, f. 1 (not *Caecilia isthmica* Cope); Boulenger 1895 Proc. Zool. Soc. London, p. 406; Boulenger 1913, Proc. Zool. Soc. London, p. 1020.

Type. BMNH 60-6-16, 58.

Type locality. West Ecuador.

Range. Western Ecuador and western Colombia. The Atrato Valley, Colombia.

Diagnosis. A Caecilia with primaries 110–119; secondaries 0–8; 1/d 27–31; eye visible; no markings; 260–630 mm.

Description. "Teeth moderately large, on each side. . . . . maxillaries 11, vomero-palatines 5, outer mandibulars 8; inner mandibulars very small, few" (Boulenger 1882). The Urrao specimen has 3 inner mandibular teeth. Mr. H. W. Parker kindly informs me that both the Peña Lisa specimens have scales; the Urrao specimen has none.

Remarks. The two Brussels specimens, first called *pachynema* and then *isthmica* by Boulenger, have not been seen by me. They are probably what is here called *güntheri*. They had 119 and 124 "circular folds." The largest was 750 mm. long. They had 6 maxillary, 6–7 palatine, and 5–7 mandibular teeth.

This species is close to *degenerata*, having fewer primaries, and to *tentaculata*, having fewer secondaries. It does not occur with either.

Specimens seen, 4, as follows:

	prim.	sec.	length	diam.	1/d
Colombia:					
Peña Lisa, Condoto					
BMNH 1913-11-12, 131	115	0	268	10	27
BMNH 1913-11-12, 132	110	0	330	12	27
Urrao on Atrato Inst. La Salle	119	0	260	9	29
West Ecuador:					
BMNH 60-6-16, 85	118	8	630	20	31

Caecilia subnigricans spec. nov.

Type. ANSP 4821.

Type locality. Magdalena River, Colombia.

Range. Known only from type locality.

Diagnosis. A Caecilia with 154–161 primaries; 17–18 secondaries; 137–143 primary folds without secondaries; eye visible; 1/d 58–62; length 350–370 mm.; no distinctive markings.

Description. Nothing can be added to the diagnosis.

Remarks. This form has fewer secondaries than *nigricans* and more primaries than *tentaculata*. It is anatomically between these two forms, neither of which occur in the Magdalena Valley, as *nigricans* is west of this area and *tentaculata* is east of it. It probably occupies the lower part of the valley, as the closely allied *thompsoni*, which has more primaries and more secondaries, is the only form known from the upper Magdalena.

Specimens seen, 2, as follows:

			prim.	sec.	length	diam.	1/d
Colombia:							
Magdalena River	ANSP	4921	161	18/8	370	6	62
"	"	4922	154	17/4	350	6	58

Caecilia armata spec. nov.

Type. Mus. Nac. Brazil 832.

Type locality. No data, probably Brazil.

Range. Unknown.

Diagnosis. A Caecilia with 185 primaries; 94 secondaries; 91 primary folds without secondaries; eye visible; 1/d 56; length 390 mm.; no color markings.

Description. It may be added to the diagnosis that the diameter is 7 mm., and that the last 12 of the secondaries are complete.

Remarks. This remarkable form has the hind half of the body with bony scales, and in that respect agrees with *dunni*. But the latter is a much shorter (123–150 primaries) form, and is usually stouter. In primary count and in proportions it falls close to *nigricans*, some specimens of which have the hind third of the body scaled. But *nigricans* has at most 62 secondaries and is a Pacific coast form, while *armata* may be presumed to be Brazilian. I offer the suggestion that the primitive scalation may have persisted at the eastern as well as the western periphery of the range of the genus. In this case the alliance might be

with another Brazilian Caecilia (*gracilis*), a species whose primary counts and proportions are also like those of *armata*. The only Brazilian *gracilis* has the highest secondary count (25) for that species.

It is a great pity that the specimen has no data, but its characters are such that it must be described as a new form.

Caecilia nigricans Boulenger

1902. *Caecilia nigricans* Boulenger, Ann. Mag. Nat. Hist. (7), **9**, p. 51; Nieden 1913, Gymnophiona, p. 13.

1913. *Caecilia intermedia* Boulenger (in part, numbers 1–4), Proc. Zool. Soc. London, p. 1026, f. 174 (St. Javier, N. W. Ecuador, type BMNH 1907–3–29, 69); Parker 1926, Ann. Mag. Nat. Hist. (9), **17**, p. 549.

1913. *Caecilia palmeri* Boulenger, 1. c., p. 1021, f. 175 (Novita, Rio San Juan, Colombia, type BMNH 1910–7–11, 72).

Type. BMNH 1901–3–29, 88.

Type locality. Rio Lita, 3000 feet, N. W. Ecuador or S. W. Colombia [= Ecuador].

Range. West coast of Colombia; Atrato valley, Colombia; Gorgona I.; west coast of Ecuador.

Diagnosis. A Caecilia with primaries 155–190; secondaries 28–62; 108–138 primary folds without secondaries; eye visible; 1/d 37–66; length 147–950 mm.; no distinctive markings.

Description. The specimens are uniform blackish. Boulenger (1902) says the type had 8 maxillary and 6 mandibular teeth. He says (1913) of the type of *palmeri* "dentition as in *C. pachynema*," and of the type of *intermedia* "outer mandibular teeth . . . . . smaller than" *pachynema*, but his figures show larger teeth in *intermedia* than in *palmeri*. He also states that the snout of *palmeri* is like that of *pachynema*; and that of *intermedia* is more strongly projecting. His figures show *palmeri* with a more prominent snout than *intermedia*.

The intromittent organ of BMNH 1913–11–12, 133 is extruded and is "10 mm. in length and terminates in a four-lobed 'glans' " (Boulenger 1913).

Remarks. The male just mentioned was "swallowed by an *Elaps rosenbergii*."

The types of Boulenger's three species, which I think synonymous, have:

prim.	sec.	1/d	
168	47	65	*intermedia*
174	43	58	*palmeri*
177	32	60	*nigricans*

C. palmeri and *C. intermedia* were described in the same publication. The only differences in the descriptions refer to minor discrepancies in dentition and snout shape, and these are directly contradicted by the figures. No comparison with Boulenger's earlier *nigricans* was given.

This form of the Pacific coast differs from *subnigricans* of the Magdalena valley in the much higher secondary count. It differs from *thompsoni* of the upper Magdalena in lower primary and higher secondary counts; and from the more eastern *gracilis* in lower primary and higher secondary counts.

Specimens seen, 19, as follows:

		prim.	sec.	length	diam.	l/d
Colombia:						
Quesada River, Atrato valley						
AMNH 13679		190	52	850	15	57
Anda Goya						
BMNH 1916–4–25, 30		175	37/6	845	17	50♂
Novita, R. San Juan						
BMNH 1910–7–11, 72		174	43/6	700	12	58
Peña Lisa, Condoto	BMNH 1913–11–12, 133	174	47	720	14	51♂
" "	BMNH 1914–5–21, 91	159	40	625	11	57
" "	BMNH 1914–5–21, 92	171	—	—	—	—
Gorgona I.	BMNH 1926–1–20, 145	166	36/3	680	12.5	57
Chocó, Inst. La Salle		188	37/10	147	4	37
No locality	BMNH 1923–7–11, 72	174	43/6	600	12.5	48
"	Hamburg 384	172	33/0	638	11	58
Ecuador:						
Rio Lita	BMNH 1901–3–29, 88	177	32/7	600	10	60
Manabi	AMNH 3872	166	43/7	485	10	48
Salidero	Vienna	173	59/7	455	7	65
St. Javier	"	180	62/3	800	12	66
"	BMNH	168	47/8	950	17	65
Pambelar	"	168	28/8	705	11	64

			prim.	sec.	length	diam.	l/d
Paramba	BMNH		166	47/8	640	14	46
"	"		155	47/7	820	19	42
Plaza d'Oro, Santiago							
	USNM	20590	162	53/5	930	20	46

Caecilia thompsoni Boulenger

1899. *Caecilia gracilis* Cope, Sci. Bull. Philadelphia Commer. Mus. **1**, p. 8 (not *Caecilia gracilis* Shaw).

1902. *Caecilia thompsoni* Boulenger, Ann. Mag. Nat. Hist. (7), **10**, p. 152; Nieden 1913, Gymnophiona, p. 14.

Type. BMNH 1902–5–15, 26.

Type locality. Villeta [between Honda and Bogotá], 3500′, Colombia.

Range. Upper Magdalena valley and Rio Caquetá, Colombia.

Diagnosis. A Caecilia with primaries 188–238; secondaries 29–41; 152–200 primary folds without secondaries; l/d 45–92; eye usually visible; no distinctive markings; length 345–1375 mm.

Description. MCZ 9726 has 8 maxillary, 4 outer mandibular and 2 inner mandibular teeth. Boulenger (1902) says the type had "teeth very large in front, 6 or 7 on a side in upper jaw, 15 or 16 in lower, 14 vomero-palatines on each side, 8 small inner mandibular teeth," and "blackish speckled with yellow on the sides." The eye is invisible in the specimen from Muzo.

Counts taken on specimens from definite Magdalena valley localities are altered by others as follows: the La Esperanza specimen raises the secondary count from 39 to 41, and lowers the difference between primary and secondary counts from 157 to 152; the Rio Caquetá specimen raises the l/d ratio from 79 to 84, and the specimen reported as *gracilis* (AMNH 49976) from "probably near Bogotá" raises it to 92.

Remarks. In each individual respect my diagnosis of *thompsoni* overlaps my diagnosis of *bassleri*, but all the specimens can be allocated by combining characters. It is distinguished from *gracilis* by higher secondary count, and from *nigricans* by higher primary count.

Boulenger measured the type as 1170 mm., diameter 13. I measure it as 1000 mm., diameter 15. Cope measured AMNH 49976 as 1300 mm. I measure it as 1375 mm. This is the largest American Caecilian.

Specimens seen, 10, as follows:

		prim.	sec.	length	diam.	l/d
Colombia:						
Villeta	BMNH					
	1902–5–15, 26	192	29/0	1000	16	62 TYPE

			prim.	sec.	length	diam.	l/d
Honda or Bogotá	MCZ	9726	188	29/8	670	15	45
Ibaque	MCZ	24522	207	39/7	370	6	62
Muzo	MCZ	24521	238	38/8	790	10	79
La Mesa near Bogotá,	Inst. La Salle		187	30/0	550	11	50
Bogotá ?	AMNH	49976	217	37	1375	15	92
Rio Caquetá	BMNH	1902–5–29, 179	212	35	760	9	84
no data	MCZ	24523	193	29/0	680	12	57
La Esperanza, Brussels			193	41/7	490	10	49
N. S. Amer.	Hamburg 1936		197	39	345	5.5	63

The British Museum Rio Caquetá specimen seems to be this species but has confusing locality data. Additional information gives "Cauca Valley, S. E. Colombia, collected by Dr. M. D. Eder, purchased through Rosenberg." The Rio Caquetá is in southeast Colombia, is a tributary of the Amazon, is not an unlikely place for *thompsoni* as it heads near the head of the Magdalena, but it is not in the Cauca valley.

The Cauca valley has a Rio Cóqueta, but this is in *northeast* Colombia, and is a very unlikely place for *thompsoni*.

Caecilia gracilis Shaw

1758. *Caecilia tentaculata* Linné (in part, the reference to pl. 5, f. 2, Mus. Adolph. Frid.) Syst. Nat. (10), p. 229.

1802. *Caecilia gracilis* Shaw, Gen. Zool. 3, **2**, p. 597; Gray 1850, Cat. Batr. Grad. Brit. Mus., p. 57; Dumeril 1863, Mem. Soc. Sci. Nat. Cherbourg **9**, p. 313; Peters 1879, Mon. Ak. Berlin, p. 935; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 75; Nieden 1913, Gymnophiona, p. 13.

1803. *Caecilia lombricoidaea* Daudin, Hist. Nat. Rept. **7**, p. 420, pl. 92, f. 2 (Surinam, types Paris 12); Dumeril and Bibron 1841, Erp. Gen. **8**, p. 275, pl. 85, f. 2.

1820. *Caecilia lumbricoides* Merrem, Vers. Syst. Amph., p. 168 (emendation); Cuvier 1829, Regn. Anim. (2), p. 100; Gray 1831, in Griffith's Cuvier's Anim. King. **9**, App., p. 110; Wiedersheim 1879, Anat. Gymn., pl. 2, f. 14, 19, 20, 22, pl. 6, f. 61, 65–7, pl. 7, f. 72–4, 76–9, 81, pl. 9, f. 89.

1820. *Caecilia lumbricoidea* Goldfuss, Handb. Zool. **2**, p. 138 (emendation); Wagler 1830, Nat. Syst. Amph., p. 198; Tschudi 1838, Mem. Soc. Sci. Neufchatel **2**, p. 90.

1850. *Caecilia vermiformis* Gray, Cat. Batr. Grad. Brit. Mus., p. 57 (MSS name of Shaw, quoted in synonymy of *C. gracilis*).

Type. Not known to exist. BMNH 1929–5–16, 2 is from the Shaw collection and was named by Dr. Shaw (Boulenger 1882, p. 75, spec. "g") but does not agree with Shaw's measurements, which were 13¾" long and ⅓" in diameter. Since no type was named this may be a cotype.

Type locality. "America."

Range. The Guianas; Para, Brazil; Iquitos, Peru. Sea level to 500 feet.

Diagnosis. A Caecilia with primaries 185–214; secondaries 8–25; 1/d 48–93; eyes usually visible; no markings; length 165–680 mm.

Description. The measurements show that this form becomes slimmer with age. BMNH 66–8–14, 341, the largest specimen, has the eye invisible but not covered by bone.

Data taken from Guianan specimens is altered by others as follows:

The primary count is raised from 207 to 214 by the Para specimen, and the secondary count is raised by it from 23 to 25. The Vienna specimen from "S. Amer." lowers the secondary count from 9 to 8.

Remarks. The Guiana population to which the name *gracilis* applies is abundantly distinct from any other Guiana form, but is very confusingly allied to some of the western forms of the genus.

C. thompsoni of the upper Magdalena is larger, and has more secondaries, but the primary counts overlap those of *gracilis* in the range 188–214.

C. bassleri of Ecuador and Peru overlaps *gracilis* in all the numerical counts (primaries from 206 to 214, secondaries from 14 to 25, 1/d from 85 to 93). On combining characters, all specimens can be placed in one of the two forms. The two occur together at Iquitos, Peru.

C. pachynema of Ecuador and Peru overlaps *gracilis* in all the numerical counts (primaries 185–199, secondaries 8–11, 1/d 48–84). I have seen seven specimens within this range of overlap in all counts. These can only be allocated on the basis of color (when present in *pachynema*) and by locality.

C. polyzona of the Cauca Valley, has all its numerical counts within the range of those of *gracilis*. Specimens can be distinguished by color, by visibility of the eye, and by locality.

C. ochrocephala of Panamá and northwestern Colombia overlaps *gracilis* in all the numerical counts (primaries from 185 to 192, secondaries from 8 to 25, 1/d from 48 to 87). I have seen 26 specimens (8 *gracilis* and 18 *ochrocephala*) within this range of overlap in all counts. These specimens have been allocated by color, by visibility of the eye, and by locality.

Specimens seen, 31, as follows:

			prim.	sec.	length	diam.	1/d
British Guiana:							
Dunoon	Michigan	47410	185	16	328	6	55
		47411	187	10	385	5	77
		47411	188	14	285	5	57
		47411	192	13	200	4	50
		47411	197	9	165	3	55
		52507	187	14	321	6	53
Wismar	Michigan	76676	189	10/3	295	4.5	66
Maccasscema	BMNH						
	87-1-22, 30		199	14/3	330	5	66
Demarara	"		—	—	—	—	—
No locality	USNM	58750	204	11/3	245	5	49
Oronoque R.	Field	35116	198	16/5	278	3	93
Dutch Guiana:							
Surinam	ANS	4923	207	23/0	440	5	88
		4924	190	12/4	490	7	70
Surinam	BMNH						
	66-8-14, 341		195	22/9	680	11	62
	70-3-10, 58		203	16/6	444	5	89
	70-3-10, 60		202	17/5	472	6	79
"	Berlin	5826	199	15/2	367	4	92
	Vienna		200	—	165	3	55
	Munich		—	—	310	4	77
	MCZ	6637	201	22/0	370	7.5	48
	Paris	12	197	—	405	5	81
"	Paris	12	204	—	540	7	77
French Guiana:							
Cayenne	Paris	12b	—	—	—	—	—
"	"	12c	—	—	—	—	—
"Guiana":	Paris	12d	—	—	—	—	—
Brazil:							
Para	Vienna		214	25/6	370	4	92
Peru:							
Iquitos	AMNH	42851	188	21/8	390	7	56

			prim.	sec.	lgth.	diam.	1/d
South America:							
No locality	AMNH	23658	190	14/5	398	6	66
	BMNH						
	1929–5–16, 2		184	14/7	500	6	83
	Berlin	3700	197–	9/2	500	6	83
"	Vienna		198	8/4	420	5	84

Caecilia bassleri spec. nov.

Type. MCZ 19401.

Type locality. Pastaza R., Ecuador (Canelos to Marañon).

Range. Eastern Colombia; eastern and western Ecuador, eastern Peru. Sea level to 500 feet.

Diagnosis. A Caecilia with primaries 206–285; secondaries 14–41; 1/d 80–160; 495–865 mm.; eyes visible or invisible.

Description. Uniform dark, head a little lighter. The eyes are invisible in AMNH 3874, in the Colombian specimen, and in MCZ 19401. Three have the 1/d below 105. A single specimen has the primary count below 227. The other eight have the 1/d over 104 (no other Caecilia has the 1/d over 93) and primaries over 226 (no other Caecilia has a primary count above 217, except the Panamanian *elongata* which has no secondaries and the Colombian *thompsoni*, which is stouter).

Remarks. Probably allied to *thompsoni* and to *gracilis*. Both *gracilis* and *bassleri* occur at Iquitos, Peru.

It is a pleasure to name this form, extreme alike in slimness and in number of vertebrae, for my friend Dr. Harvey Bassler, whose collection of Peruvian Caecilians included five of this species.

Specimens seen, 12, as follows:

			prim.	sec.	length	diam.	1/d
Western Ecuador:							
Rio Cayápas	AMNH	3874	206	32/13	725	6	121
St. Javier	BMNH						
	1901–3–29, 66		251	14/3	832	7	119
	BMNH						
	" 60–6–16, 86		227	14/4	650	5	130
No locality							
Eastern Ecuador:							
Rio Pastaza	MCZ	19401	271	41/8	800	5	160
Canelos	BMNH						
	80–12–8, 141		254	28/0	495	4	124

		prim.	sec.	length	diam.	1/d
Eastern Peru:						
Iquitos	AMNH 42852	285	17/0	865	7	124
Monte Carmelo, nr. Requena lower Ucayali	AMNH 45327	257	25	840	7	120
Pampa Hermosa, mouth of Cushabatay, Mid. Ucayali	AMNH 42840	230	28/9	630	6	105
	" 42841	232	30/6	655	6	109
Chaquimayo, Carabaya	BMNH 1908-3-11, 1	231	21/4	770	9	85
Mouth Rio Santiago	AMNH 42832	234	17	640	8	80
Eastern Colombia:						
Rio Putumayo, Punto Asïs	Inst. La Salle	244	25/6	800	10	80

Caecilia ochrocephala Cope

1866. *Caecilia ochrocephala* Cope, Proc. Acad. Nat. Sci. Philadelphia **18**, p. 132; Peters 1879, Mon. Ak. Berlin, p. 935; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 94; Brocchi 1883, Miss. Sci. Mex., Batr., p. 119, pl. 21, f. 1; Dunn 1931; Occ. Papers Boston Soc. Nat. Hist. **5**, p. 408.

1885. *Herpele ochrocephala* Cope, Proc. Amer. Phil. Soc. **22**, p. 171; 1885, Proc. Amer. Phil. Soc. **23**, p. 279; 1887, Bull. U. S. Nat. Mus. **32**, p. 9; Boulenger 1895, Proc. Zool. Soc. London, p. 409; Günther 1902, Biol. Centr. Amer., Rept., p. 307; Nieden 1913 (in part) Gymnophiona, p. 20; Dunn 1928, Proc. New England Zoöl. Club **10**, p. 73.

1876. *Caecilia gracilis* Garman, Proc. Boston. Soc. Nat. Hist. **18**, 412.

1906. *Caecilia sabogae* Barbour, Bull. Mus. Comp. Zoöl. **46**, p. 228 (Saboga Island, Panamá. Types MCZ 2425).

Type. USNM 29764, collected by Gallaer and LeConte.

Type locality. Atlantic side Isthmus of Darien.

Range. Province of Coclé, Panamá to Turbo, Colombia. Sea level to 2000 feet.

Diagnosis. A Caecilia with 171–192 primaries; 7–29 secondaries; 149–179 primary folds without secondaries; eyes invisible; pale gray, with black primary grooves; 1/d 39–87; length 151–610 mm.

Description. The eyes are invisible in all specimens seen. Nearly all specimens are colored as Cope described the type, "yellowish plumbeous. The plicae dark; head and throat ochre yellow." A specimen from Panamá Sabanas in the MCZ is pale and uniform; USNM 52486 from "Panamá" has paired light dorsolateral spots on each segment, thus resembling *C. pachynema* in color.

Outer mandibular teeth 8–9 on a side, inner 3–4, maxillary teeth 7–9 on a side; palatine teeth 10–13 on a side.

The range of variation in primary and secondary count found in 71 Canal Zone specimens is slightly exceeded by one from Cana which raises the primary count from 189 to 190; by one from San Miguel Island which raises the primary count to 192; by the type and the Cana specimen which raise the secondary count from 28 to 29.

Of 100 primary counts, 89 are from 174–188, six are below this range and five above. Of 98 secondary counts, 83 are from 10–25, seven are below this and eight above. Of 94 l/d ratios, 84 are from 41–65, four are 39–40, six (four in one lot and poorly preserved) are 66–87.

Remarks. C. ochrocephala has been taken in excavations on Barro Colorado Island at a depth of some ten feet below the surface.

In 1928 I reported finding eggs 3 mm. in diameter in a female, four on the right side and five on the left.

C. ochrocephala is similar to *C. polyzona* of the Cauca valley in color and in condition of the eye, but has a lower primary count.

C. ochrocephala is similar to *C. gracilis* of Guiana, Brazil and eastern Peru in numerical counts (8 *gracilis* and 18 *ochrocephala* fit in the region of overlap of the three counts), but differs in color and in condition of eye.

C. ochrocephala is also similar to *C. pachynema* of Colombia, Ecuador and Peru in numerical counts (6 *pachynema* and 19 *ochrocephala* fit in the region of overlapping of all three counts; primaries 171–192, secondaries 7–11, l/d 40–84). It differs from *pachynema* in color (usually) and in condition of eye.

Specimens seen, 101, as follows:

		prim.	sec.	length	diam.	l/d
Panamá Canal Zone:						
Fort Sherman MCZ	9610	183	10/2	382	9	42
	10665	176	13/0	233	6	39
	10671	173	22/1	610	12	51
Cristobol Iowa State		174	15/0	250	5	50

			prim.	sec.	length	diam.	l/d
Gatun	AMNH	6644	178	21/4	414	7	59
	MCZ	9589	176	23/5	490	—	—
		9590	183	16/0	410	7	58♂
		9591	183	12/0	402	8	50
		9592	173	18/0	430	10	43
		9593	178	23/3	355	9	39
		9594	179	15/3	382	8	48
"	"	9595	181	29/3	325	7	46
San Pablo	MCZ	1306	183	24/4	242	5	48
"	AMNH	18670	184	10/0	310	6	51
Gorgona	MCZ	1493	175	23/3	375	7	53
Monte Lirio	MCZ	14816	171	20/2	515	10	51
Chagres River	MCZ	16289	182	26/4	285	6	64
Indio on Chagres							
	USNM	102850	184	16/4	211	4	53
Barro Colorado I.							
	MCZ	11855	173	18/2	375	7	53
		11856	172	23/2	310	7	44
Majagual	"	10672	174	20/2	382	7	54
		10673	175	25/5	244	6	41
		10674	179	25/5	328	7	47
Summit Lindsay coll.			—	—	—	—	—
Albrook Field E. R. Dunn coll.			185	17/0	261	6	43
			186	8/8	302	6	50
"	"		182	13/0	294	6	49
Corozal	Carnegie	8698	184	13/3	335	6	56
"	"	8699	179	10/0	340	7	49
"	MCZ	16290	185	12/3	370	7	53
"	"	16291	179	12/3	365	7	52
		16292	177	12/0	330	6	55
		16293	182	16/0	328	6	55
		16294	175	17/0	248	5	50
		16295	186	12/2	355	6	59
		16296	185	10/0	350	7	50
		16297	185	13/4	320	6	53
		16298	185	9/0	208	4	52
"	"	17888	184	9/0	390	8	49
Fort Clayton	USNM	65845	186	10/1	400	7	57
"	"	65846	181	28/1	390	7	56

			prim.	sec.	length	diam.	l/d
Fort Clayton	MCZ	14821	177	19/3	291	6	48
		14822	179	11/3	354	6	59
		14823	183	17/5	395	7	56
		14824	179	8/0	360	7	51
		14825	175	7/1	344	8	43
		14826	179	12/0	265	5	53
		14827	183	21/3	436	7.5	58
		14828	176	17/0	308	7	44
		14833	185	17/0	262	5	52
		14834	185	25/0	190	4	47
		14835	188	9/1	260	4	65
		14836	183	17/0	210	4	52
		14837	183	13/3	151	3	50
		14838	184	19/0	290	5	58
		15721	180	22/3	295	6	49
"	"	15722	184	24/5	258	5	52
Balboa Carnegie		8490	184	24/4	457	8	57♂
" "		8491	181	20/4	356	6	59
Ancon	MCZ	8600	173	14/0	545	12	45
		10675	178	19/2	382	7	54
		14817	189	27/5	525	8	66
		14818	180	17/4	435	5	87
		14819	178	20/3	472	7	67
Ancon	MCZ	14820	183	23/2	522	7	75
"	BMNH						
	1926-1-20, 72		177	16/3	350	7	50
Ancon or Balboa							
	MCZ	14829	183	25/4	420	10	42
Madden Dam	ANS	21825	185	16/3	325	5.5	59
		21826	183	26/4	335	5	67
"Canal Zone"	USNM	37857	189	17/2	428	7	61
		37858	182	11/3	407	8	51
Panamá							
Rio Grande to Rio Coclé,							
Prov. Coclé	MCZ		181	13/2	321	8	40
Nombre de Dios							
	MCZ	14832	182	10/0	290	7	41
Panamá City	"	4268	181	15/0	331	9	46
		15719	183	10/0	410	—	—
		15720	180	21/3	450	11	41

			prim.	sec.	length	diam.	1/d
Panamá-Sabanas	MCZ		177	10/0	370	9	44
			179	15/0	352	8	53
"	"		178	8/0	420	8	40
Saboga I.	"	2425	181	24/4	375	6	50
"	"	2425	181	11/3	—	—	—
San Miguel I.	"	2503	192	21/4	470	11	43
Caña, 2000′	USNM	50249	190	29/2	490	10	49
Atlantic side Darien							
	USNM	28185	180	10/2	420	6	70
"	USNM	29764	185	29/2	330	6.5	50
Darien Isthmus	Vienna		175	—	—	—	—
"	"		189	—	—	—	—
"Panamá"	Paris 7 alpha		184	21	—	—	—
	BMNH 87-12-12, 1		182	18/2	531	10	53
	BMNH 94-5-9, 6		185	21/4	450	9	50
	USNM	14116	181	20/5	428	8	53
	"	52495	187	27/3	550	10	55
	"	52496	185	12/4	505	11	46♂
	"	52497	180	18/5	480	9	53
	"		181	10/3	490	12	41
	MCZ	1521	187	23/0	535	10	53
	"	"	178	19/4	355	—	—
	ANS	4919	185	12/2	425	7	60
	MCZ	2502	185	20/7	432	7	61
Colombia:							
Turbo	MCZ	1492	185	23/3	355	7	50
"Brazil"	MCZ		188	10/0	495	9	55

CAECILIA POLYZONA Fischer

1879. *Caecilia polyzona* Fischer, in Peters, Mon. Berlin Ak., p. 936; Fischer 1880, Arch. Naturg. **46**, **1**, p. 215, pl. 8, f. 1–4; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 94; 1895, Proc. Zool. Soc. London. p. 407.

1913. *Herpele ochrocephala* Nieden (in part), Gymnophinna, p. 20.

Type. Originally two specimens in the Berlin Museum, collected by Grosskopf. One is now AMNH 23449, the whereabouts of the other is not known.

Type locality. Caceres, Prov. Antioquia, Colombia.

Range. Cauca Valley, Colombia.

Diagnosis. A Caecilia with 204–209 primaries; 10–17 secondaries; 1/d 43–67; eyes invisible; "brownish gray, head little lighter, grooves black, light gray below"; length 560–670 mm.

Description. Fischer (1880) gives a count of the dentition which apparently includes the teeth of both sides; 22–25 maxillary; 20–22 vomerine; 20 outer mandibular; 10–12 inner mandibular. The missing type had 209 primaries, 10 secondaries, 1/d 59, and was 650 mm. long.

Remarks. *C. polyzona* is very close to *ochrocephala*, the only difference being the higher primary count.

Specimens seen, 2, as follows:

			prim.	sec.	length	diam.	1/d
Colombia:							
Cauca Valley	Vienna		204	17/0	560	13	43
Caceres	AMNH	23449	207	12	670	10	67

Caecilia pachynema Günther

1859. *Caecilia pachynema* Günther, Proc. Zool. Soc. London, p. 417; Cope 1868, Proc. Acad. Nat. Sci. Philadelphia, p. 118; Peters 1879, Mem. Ak. Berlin, p. 935; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 95, pl. 6, f. 2; 1895, Proc. Zool. Soc. London, p. 407; Nieden 1913, Gymnophiona, p. 13; Parker 1934, Ann. Mag. Nat. Hist. (10), **14**, p. 265.

1884. *Caecilia buckleyi* Boulenger, Ann. Mag. Nat. Hist. (5), **13**, p. 398 (Intac, Ecuador, type BMNH 78-1-25, 47); 1895, Proc. Zool. Soc. London, p. 407, pl. 23, f. 1; Nieden 1913, Gymnophiona, p. 13.

Type. BMNH 66-6-16, 87, collected by Fraser.

Type locality. Western Ecuador.

Range. Colombia; Ecuador; Peru. Sea level to 6200 feet.

Diagnosis. A Caecilia with primaries 154–199; secondaries 0–11; 1/d 38–84; eyes visible; usually with a lateral yellow spot on each segment; length 145–900 mm.

Description. MCZ 16288 has 6 maxillary teeth, 4 palatine teeth, 4 large mandibular teeth, and 1 inner mandibular tooth. Günther (1859)

says that the type has "5 hook-like teeth on each side, the anterior larger, three palatal teeth." Boulenger (1882) says of the same specimen "teeth large, few, widely separated; inner mandibulars very small few;, outer mandibulars very large, anterior largest, 5; maxillaries 6; vomeropalatines 9." Cope (1868) says that two specimens from Guayaquil had 8 maxillary teeth, 6 mandibulars, and 5 palatine. The type of *buckleyi* had (Boulenger 1884) "maxillary teeth large, 10 on each side. Vomeropalatines 8 on each side. Inner mandibulars small, few. Outer large—9 on each side."

All specimens with secondaries have scales. Those without secondaries have scales or lack them in about equal numbers (cf. Parker 1934).

No scales, 6: Zamora; type *pachynema*; type *buckleyi*; Normandia, Villavicencio; Medina Mts.

Scales, 4: Milligalli, Intac (2), Pallatanga.

Colombian specimens lower the Ecuadorian primary range from 160 to 159 and 154, and lower the 1/d ratio from 40 to 38; Peruvian specimens raise the Ecuadorian primary range from 192 to 194 and 199, and raise the Ecuadorian secondary count from 10 to 11.

The primaries are usually interrupted dorsally and ventrally. Most specimens have a large yellow spot on each side of each segment.

Remarks. Two specimens in the Berlin Museum (3716 and 3722) from Guayaquil are labeled as types of *C. guntheri* Peters. This is incorrect as the type of *guntheri* Peters (a substitute name for *C. rostrata* Günther, not *C. rostrata* Cuvier which is now called *Hypogeophis rostratus*) is BMNH 60-6-16, 85, the specimen erroneously called *C. rostrata* by Günther.

The type of *C. buckleyi* Boulenger seems to me a very young specimen of *pachynema*, which is stouter than larger individuals. A still smaller individual from Colombia is even stouter.

Specimens with primaries 185–199, secondaries 8–11, and 1/d 49–84 fit into the diagnostic counts of both *pachynema* and *gracilis*, and have been allocated by color and by locality.

Specimens with secondaries 7–11 agree in almost all counts with *ochrocephala*. These have been allocated on color, condition of eye, and locality.

This species occurs on both sides of the Andes, but is known to reach an altitude of 6200 feet at Milligalli (record altitude for an American Caecilian) and, if the Quito locality is correct, which I doubt, it reaches 9274 feet.

Specimens seen, 25, as follows:

			prim.	sec.	length	diam.	l/d
Colombia:							
Medellin	ANS	12980	159	2	519	10	52
	AMNH	49973	166	7	467	6	78
Villavicencio	Inst. La Salle		180	0	270	5	54
Medina Mts.	N. E. Villavicencio						
	AMNH	49959	156	0	145	4	38
No data	MCZ	16288	154	0	900	15	60
Ecuador:							
Guayaquil	Berlin	3716	168	0	468	7	66
	Berlin	3722	172	10/7	490	6	81
	USNM	12353	183	6/2	380	4.5	84
	BMNH						
	85-2-23, 15		172	8/4	380	6	63
Quito	Paris	11	181	5	780	11	71
Intac, 3000′	BMNH						
	78-1-25, 46		162	0	476	10	47
	47		181	0	160	4	40
	Michigan		158	8/0	750	12	63
	"		172	0	745	12	62
Milligalli, 6200′	BMNH						
	85-2-23, 14		164	0	820	12	68
Pallatanga, 5000′							
	AMNH	16986	160	0	630	12	52
Normandia, Zunia, Upana R.,							
1400-1800 m.	AMNH	23434	174	0	726	10	73
"Western Ec."	BMNH						
	66-6-16, 87		168	0	468	7	66
No data	Munich 148/1912		169	0	550	12	46
"	Vienna		192	10	375	6	62
Peru:							
No data	Vienna		169	11/0	415	7	59
"	"		194	0	410	6	68
"	"		199	0	385	6	64
"	ANS	16129	165	11/0	211	3	70
No data:	Smith College		190	2	485	8	60

Parker (1934) has recorded *pachynema* from Zamora, Ecuador, 3250 feet, a locality which is like Normandia, on the east face of the Andes.

Caecilia elongata spec. nov.

Type. Munich 1327/0.
Type locality. Panamá.
Range. Known only from Yavisa, Darien, Panamá.
Diagnosis. A Caecilia without secondaries; primaries 226–231; l/d 83–89; no scales; eye invisible; no markings; 500–620 mm.
Remarks. The high primary count and the complete absence of secondaries render this form quite distinct. The head-and-neck from Yavisa looks quite different from *ochrocephala.*

Specimens seen, 3 ,as follows:

		prim.	length	diam.	l/d
Panamá:					
Yavisa	MCZ (head and neck only)	—	—	—	—
No locality	Munich 1327/0	226	620	7	89
"	" 1324/0	231	500	6	83

Chthonerpeton Peters

1879. *Chthonerpeton* Peters, Mon. Berlin Ak., p. 930, 940 (monotype *Siphonops indistinctus* Reinhardt and Lütken).

Diagnosis. Caecilians without secondaries or scales; no tail; tentacle in a horseshoe-shaped groove, on side of head between eye and nostril; eyes visible; two rows of teeth in lower jaw; anus usually a well developed sucking disk; primaries 76–166; l/d 23–57; length 170–620 mm.; three species.
Range. Argentina, Uruguay and Brazil.

Key to species of Chthonerpeton

A. Primaries 76–87; (anal disk large; tentacle slightly nearer nostril than eye); Argentina, Uruguay, and southern Brazil . *indistinctum*
AA. Primaries 133–166.
  B. Tentacle very close to nostril; anal disk medium; 145 primaries; upper Amazon . . . . *petersi*
  BB. Tentacle nearer eye than nostril; anal disk small; 133–166 primaries; southern Brazil . . . . *viviparum*.

Remarks. In number of primaries and size of anal disk *indistinctum* is at one extreme of the genus and resembles the closely allied forms of

the more northern genus Typhlonectes. In position of the tentacle, however, *petersi* is extreme and in this character it is the closest to Typhlonectes.

I have examined 39 specimens, including the types of *viviparum* and *petersii*. I have not seen the type of *indistinctum*.

CHTHONERPETON VIVIPARUM Parker and Wettstein

1907. *Siphonops braziliensis* (non Lütken) Vávra, Vesmír, Prag, **36**, 1, p. **11**, f. 10 (not seen); Nieden 1913 (in part) Gymnophiona, p. 25.

1929. *Chthonerpeton viviparum* Parker and Wettstein, Ann. Mag. Nat. Hist. (10) **4**, p. 594.

Type. BMNH 1907–8–28, 1.

Type locality. State of Santa Catharina, Brazil.

Range. States of Santa Catharina and São Paulo, Brazil.

Diagnosis. A Chthonerpeton with 133–166 primaries; tentacle nearer eye than nostril; anal disk small; l/d 36–57; 170–510 mm.

Description. (Original from type, eight from Joinville in Vienna Museum and one without data in Vienna. I have seen only the type) "primaries "143–144 and 147–149," "possibly . . . . . sexual . . . . . females . . . . . lower" [of my four additional one has 133 and one 166, so that the range is 133–166]; "largest 404, 339, and 333, mm., with diameters of 8, 8, and 7.5 mm. respectively; a half-grown specimen . . . . . 170 mm. . . . . . diameter . . . . . 4, 5 mm." These figures indicate l/d ratios of 51, 42, 44, and 36 respectively; the range of specimens I have seen being 37–57. Obviously the older are slimmer. "Tentacle . . . . . . nearer the eye than the nostril, and a little below the straight line connecting these two"; "premaxilla and maxilla 12–13 a side; palatopterygoid 9–10 a side; mandible, outer row 11–12, inner row 3–4"; "greyish-olive with a purplish tinge"; embryo with a "single pair of plate-like gills which are closely apposed to the inner walls of the oviducts, no trace of an egg-capsule being found." "Each gill is, in reality, an oval plate lying parallel to the sagittal plane of the embryo, and connected to its neck by an exceedingly short peduncle which arises from the gill at a point rather dorsal and anterior to its geometric centre." Length of embryo 62 mm., diameter 2.5 mm., length of gill-plate 14 mm.

Remarks. *Siphonops brasiliensis* occurs with this form in the state of Santa Catharina, Brazil, and the two animals have been confused by

Vávra, by Nieden and by me. The Hamburg specimen was actually in my notes as the Siphonops. Except for one specimen of each form (with 133 primaries) the Siphonops has fewer primaries and the Chthonerpeton has more. The skull and the dentition afford perfectly diagnostic characters, and the anal disk of the Chthonerpeton is usually distinct enough.

Specimens seen, 5, as follows:

		prim.	length	diam.	1/d
Brazil:					
São Paulo:					
Franca	Mus. Paul. 950	133	380	8	47
Santa Catharina:					
Joinville	MCZ 24593	166	510	9	57
No locality	Mus. Nac. Braz. 829	144	215	5	43
"	Hamburg 1937	148	355	8	44
"	BMNH 1907–8–21, 1	144	335	9	37

Chthonerpeton petersii Boulenger

1882. *Chthonerpeton petersii* Boulenger, Cat. Batr. Brit. Mus. (2), p. 104, pl. 9, f. 2; 1895, Proc. Zool. Soc. London, p. 411; Nieden 1913, Gymnophiona, p. 24.

Type. BMNH 51–9–2–6.

Type locality. Upper Amazon.

Range. Known only from type locality.

Diagnosis. A Chthonerpeton with 145 primaries; 1/d 39; tentacle much closer to nostril than eye.

Description. I see no reason to alter Boulenger's original description, which follows. "Teeth small, numerous, subequal. Snout rounded, moderately prominent; eyes not distinct through the skin; tentacle close to and behind the nostril. Body elongate; 145 circular folds, complete except the anterior 28, which are interrupted on the dorsal and ventral line. Tail indistinct, rounded. Uniform dark olive-grey, the eyes indicated by a whitish spot. Total length 620 millim.; greatest diameter of body 16 millim." "Anus largish, but smaller than in *indistinctum*." (Parker, in litt.)

Specimens seen, 1, the type.

CHTHONERPETON INDISTINCTUM (Reinhardt and Lütken)

1861. *Siphonops indistinctus* Reinhardt and Lütken, Vid. Meddel. Kjobenhavn, p. 203; Duméril 1863, Mem. Soc. Sci. Nat. Cherbourg, p. 318, p. 1, f. 3; Wiedersheim 1879, Anat. Gymnophiona, pl. 2, f. 13, 15, 16, pl. 6, f. 68, pl. 9, f. 84–7.

1879. *Chthonerpeton indistinctum* Peters, Mon. Ak. Berlin, p. 929, 940, f. 9; Boulenger 1882, Cat. Batr. Brit. Mus. (2), p. 104; Cope 1889, Bull. USNM **34**, pl. 11, f. 1–6; Boulenger 1895, Proc. Zool. Soc. London, p. 411; Ihering 1911, Rev. Mus. Paulista, p. 107; Nieden 1913, Gymnophiona, p. 24, f. 8; Procter, 1923. Ann. Mag. Nat. Hist. (9), **11**, p. 230; Gliesch 1929, Blätt. Aqua. Terr. **40**, **13**, p. 229, pl. 31; Gaggero 1934, Prelim. Ann. Mus. La Plata **3**, **1**, p. 173.

Type. In Copenhagen Museum. Not seen. Collected by Prof. Kroyer of the frigate Bellona.

Type locality. Buenos Aires, Argentina.

Range. Argentina (Buenos Aires), Uruguay, Southern Brazil as far as Paraná.

Diagnosis. A Chthonerpeton with 76–87 primaries; 1/d 20–45; anus much enlarged; tentacle slightly nearer nostril than eye; length 119–593 mm.

Description. Primaries 76–87; only three out of 27 specimens over 83; primaries indistinct and incomplete, distinct only on belly; tentacle a flap in a horseshoe-shaped groove, posterior to nostril, nearer to it than to eye (not so close to nostril as in *petersii*); uniform dark in color; anus in a large sucking disk; length from 119–593 mm.; no apparent change in length-diameter ratio with increase in size. A single 405 mm. specimen has 1/d 45; 20 others have 23–36. Uniform dark in color. According to Peters (1879) and Wiedersheim (1879) the teeth are as follows: vomerine 5–3; palatine 8–5; premaxillary 5–6; maxillary 9–8; mandibular, 13 outer and 4 inner. Argentine specimens (10) have 76–81 primaries (the type had 78); specimens from Brazil and Uruguay (12) have 76–87.

Habits. Peters (1879) speaks of its being taken from "deep in the earth"; while Gleisch (1929) tells of a 405 mm. specimen in Porto Alegre, during a rain, being on the surface, apparently in a gutter, and noticed the enlarged anal disk functioning as a holdfast or sucker.

Remarks. This, the most common and best known of the species, is in some ways the most extreme. Reinhardt and Lütken, in the original description, mention a specimen in the Paris Museum, from Brazil, which they considered this species. They also had one from Buenos

Aires with 78 primaries. The Paris specimen was said to have 100 primaries, and to this day *indistinctum* is always said to have 78–100 primaries. I found two specimens in Paris labeled *Cthonerpeton indistinctum;* Paris 17, Brazil, primaries 91 or 92, length 261 mm., diameter 6 mm., 1/d 43; and Paris 17a, Buenos Aires, primaries 78. Paris 17 is, I imagine, the specimen referred to by Reinhardt and Lütken. It is a young *Siphonops annulatus*, very dry, and with the tentacle much further from the eye than usual in that species, and I imagine that it was this feature which misled Reinhardt and Lütken. Duméril (1863) counted 98 primaries and mentions the white grooves and the tentacle position.

Specimens seen, 33, as follows:

		prim.	length	diam.	1/d
Argentina					
Southern Argent.	Munich	81	593	20	30
Buenos Aires	Paris 17a	78	405	9	45
" "	AMNH 11949	79	251	9	28
" "	Frankfort 2104a	81	430	15	29
No locality	Mus. Paul. 959	78	317	10	32
	" " 959a	77	247	9	27
	Berlin 26340	78	—	—	—
	Berlin 26340	76	—	—	—
	" "	—	119	4	30
	" "	—	—	—	—
	AMNH 23508	80	188	5.5	34
Isla Ella, R. Paraná	BMNH 1926–5–29–17	80	—	—	—
Uruguay:					
Durazno	USNM 65538	78	240	9	27
Brazil:					
Rio Grande do Sul					
Porto Alegre	Berlin 9559	80	355	13	27
" "	" 6803	80	160	6	27
" "	" "	—	160	5	32
" "	" "	86	210	7	30
" "	" "	80	330	11	30
" "	BMNH 83–1–19–2	83	189	6	31
" "	AMNH 23507	76	163	4.5	36
Camaquam R.	BMNH 89–8–24–4	87	365	14	26

		prim.	length	diam.	1/d
No locality	AMNH 23506	77	165	6	27
"	Berlin 10458	79	165	7	24
"	" "	80	270	9	30
"	MCZ 1501	76	260	11	24
Santa Catharina	Hamburg 5	82	390	13	30
Joinville	Mus. Nac. 844	82	300	13	23
Paraná	" " 846	83	300	13	23
Castro Tibeira, Rio Paraná					
	BMNH 1922-11-23-10	(head only)			
No state or locality	Berlin 16445	—	—	—	—
	" "	—	—	—	—
"Central America"	Hamburg 1715	76	278	11	25
No data	ANS 13948	76	205	9	23

Gaggero (1934) has recorded it from the mouth of the Rio Santiago, Argentina.

Procter (1923) states that the Castro Tibeira specimen was taken from the belly of a *Sorellina brandon-jonesii*.

Typhlonectes Peters

1879. *Typhlonectes* Peters, Mon. Berlin Ak., p. 930, 941 (type *compressicauda*).
1912. *Thyphlonectes* Peracca, Mém. Soc. Sci. Neufchatel, **5**, p. 111.

Note. I hereby designate *Caecilia compressicauda* Duméril and Bibron as the type of Typhlonectes Peters. The genus as originally described contained *compressicauda*, *dorsalis*, *natans*, and, with a query, *syntremus*.

Diagnosis. Caecilians without scales or secondaries; primaries poorly developed; eyes visible; two rows of teeth in lower jaw; no tail; anus in a well developed sucking disk; tentacle in a horseshoe-shaped groove, on side of head very close to and posterior to nostril; laterally flattened with a dorsal keel and fin in the posterior part of body; aquatic; primaries 77–105; 1/d 12–41; length 140–695 mm.; two species; three forms.

Range. Colombia, Venezuela, Guiana, Brazil; Atrato, Magdalena, Orinoco and Amazon systems.

Key to forms of Typhlonectes

A. Somewhat compressed; dorsal fin restricted to posterior; head large.
   B. Primaries 77–87; Guiana and Brazil .... *compressicauda compressicauda*
   BB. Primaries 86–105; Venezuela and Colombia .... *compressicauda natans*

AA. Extremely compressed; dorsal fin nearly to head; head small; primaries 88–104; Venezuela, Guiana, and Brazil .... *kaupii*

Remarks. The genus is very close to Chthonerpeton. Among the forms, *kaupii* is decidedly the most specialized.

I have examined 58 specimens, including types of *compressicauda*, *natans*, *venezuelense*, and *dorsalis*. I have not seen the type of *kaupii*, or of *microcephala*.

Typhlonectes compressicauda compressicauda (Duméril and Bibron)

1841. *Caecilia compressicauda* Duméril and Bibron, Erp. Gen. **8**, p. 278; Gray 1850, Cat. Batr. Grad. Brit. Mus. p. 57; Duméril 1863, Mem. Soc. Sci. Nat. Cherbourg **9**, p. 316; Peters 1874, Mon. Berlin Ak., p. 45 (habits); 1875 idem, p. 683, f. 1–4 (habits).

1879. *Typhlonectes compressicauda* Peters, idem, p. 941, f. 11; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 102; Sarasin and Sarasin 1887, Ergeb. Forsch. Ceylon, **2**, p. 26, fig.; Boulenger 1895, Proc. Zool. Soc. London, p. 4111; Nieden 1913, Gymnophiona, p. 22, f. 16.

1912. *Thyphlonectes compressicauda* Fuhrmann, Mem. Soc. Sci. Neufchatel, **5**, p. 119, f. 4.

Type. Paris 18.

Type locality. Cayenne.

Range. British Guiana to Para, Rio Purus, and Rio Solimoes.

Diagnosis. A Typhlonectes with fin in posterior third of body; primaries 77–87; l/d 12–24; length 148–515 mm.

Description. In general the larger specimens seem to be slimmer, but in these more or less flattened forms the length-diameter ratio is very uncertain. Only two specimens have the primaries below 83. Secondaries have been recorded by Fuhrmann (1912) on material which I have not seen. In this species, and still more in *natans*, the primaries are

very hard to count, and indistinct. At the same time adventitious folds appear and are liable to be taken for primaries or secondaries or both. The primaries are all incomplete on the back, and no true secondaries are present. The color is uniform blackish.

Habits. Peters (1874) states from a communication of Jelski that an adult female was taken in a fishing net in the Kaw river, eastern Guiana. Between the river and the house she gave birth to a single young. She was immediately killed, and five more young were found in the oviducts. The mother measures 500 mm., the young one was 157 mm. long, and an embryo measured 136 mm. No gill slits were observed, but there were two large, flattened, allantoic gills which measured 55 mm. Peters (1875) figures one of these, and so do the Sarasins (1887).

A specimen in the American Museum, from Manáos, was found "in a dead log come up out of the water."

Remarks. This beast is closely related to *natans.* The ranges are adjacent, and the relationship so close that I regard the two as races. Fuhrmann (1912) came to the conclusion that Guiana *compressicauda* and Venezuelan animals were racially different, since according to him a specimen from Guiana had 84 primaries, and two Venezuelan specimens had 94 and 95 primaries. He therefore called the Venezuelan form *Typhlonectes compressicauda venezuelense.* His primary count for this form does not differentiate it from *natans,* for which he himself gives 90–95. He regarded the difference between *compressicauda* and *natans* to be the higher head and close approximation of nostril and tentacle in *compressicauda,* as against the flatter head and less approximated tentacle and nostril of *natans.* These differences are scarcely appreciable, although Fuhrmann figures them. His figure of *venezuelense,* furthermore, shows a quite intermediate condition in these two respects between his figures of *compressicauda* and of *natans.* I regard the primary count as of more importance, and judged by that criterion, *venezuelense* is indistinguishable from *natans.*

Specimens seen, 17, as follows:

		prim.	length	diam.	1/d
British Guiana:					
Haraaruni Cr., Demarara R. U. Mich. 82854		? 79	—	—	—
French Guiana:					
Kaw River	Berlin 8170	—	157	10	16 larva

		prim.	lgth.	diam.	1/d
No data	Paris 18	83	—	—	—
					TYPE
	18	—	—	—	—
					TYPE
	18	84	150	9	15
					TYPE
	18a	83	455	20	23
No locality	Vienna	85	148	—	—
Brazil:					
Para	MCZ 289	85	495	25	20
Monte Alegre, Grande Para					
	BMNH 1926-10-28-7	84	375	23	16
" "	BMNH 1926-10-28-7	—	175	15	12
Manáos	AMNH 12979	87	—	19	—
"	BMNH 93-4-24-2	84	515	24	21
"	" 1913-3-11-1	84	215	10	21
"	" 1916-4-12-1	77?	—	—	—
"	" 1916-4-12-2	85	391	27	14
Ayapua, Rio Purus	Berlin 31991a	86	345	20	17
Solimoes, Amazonas	Berlin 30991b	—	435	18	24

Typhlonectes compressicauda natans (Fischer)

1879. *Caecilia natans* Fischer, in Peters, Mon. Berlin Ak., p. 941; 1880 Arch. Naturg. **46**, **1**, p. 217, pl. 8, f. 5–7.

1879. *Typhlonectes natans* Peters, loc. cit., p. 941; Boulenger 1882, Cat. Batr. Grad. Brit. Mus. (2), p. 103, pl. 9, f. 3; 1895, Proc. Zool. Soc. London p. 411; Nieden 1913, Gymnophiona, p. 23, f. 17; Heimroth 1915, Blätt. Aqua. Terr. **26**, p. 34 (habits).

1912. *Thyphlonectes natans* Peracca, Mém. Soc. Sci. Neufchatel, **5**, p. 111; Fuhrmann 1912, t. c., p. 113, f. 1–3.

1888. *Typhlonectes compressicaudus* Cope, Journ. Morph. **2**, **2**, 1889, pl. 22, f. 5 (otic region); 1889, Bull. U. S. Nat. Mus. **34**, pl. 51, f. 20 (hyoid).

1912. *Thyphlonectes compressicauda venezuelense* Fuhrmann, loc. cit., p. 124. f. 5–6 (Maracaibo, Venezuela, COTYPE Hamburg 823).

Types. Berlin 9522–3, 3772; AMNH 23486; BMNH 81–4–9, 5.

Type locality. Cauca R., Colombia.

Range. Colombia, Venezuela, Trinidad.

Diagnosis. A Typhlonectes with dorsal fin in posterior part of body; primaries 86–105, incomplete; 1/d 15–41; length 140–615.

Description. Only a single specimen out of 18 has the primaries above the range of 86–97. Peters and Fuhrmann have both counted secondaries in this form. I have been unable to make any out. There is no clear indication of any change of proportions with age. I find four inner mandibular teeth in U. Mich. 60881. Fischer (1880) gives for this row 14, and for the outer mandibular 38, for the maxillary 40–42, and for the vomerine 34–36. These are total counts, and the Michigan specimen then has 8 inner mandibular teeth as against 14 in the type.

The color is rather uniformly dark. Fischer says a little lighter below. The anal disk is white. Its diameter in the two types was 7 and 6 mm. respectively.

Habits. The types were taken by fishing. A specimen from Quesada R. was "floundering in test pit." Peracca (1914) says "caught on a line at Puerto Berrio in the Magdalena." Heimroth (1915) says he received a 480 mm. female July 14, 1914. On Jan. 16, 1915, four young were born to her. They measured 190–200 mm. and had no sign of gills. MCZ 24525 is 140 mm. long. It has no sign of gills or gill slits.

Remarks. The relationship of *natans* to *compressicauda*, and the status of *venezuelense* as a synonym of *natans* have been dealt with under *compressicauda*. The Bogotá specimens must be mislabelled.

Specimens seen, 22, as follows:

			prim.	lgth.	diam.	l/d
Colombia:						
Caceres	BMNH 81-4-9, 5		—	369	11	33 TYPE
"	Berlin 9522		93	462	15	30 TYPE
"	" 3772		90	475	25	19 TYPE
"	AMNH 23496		94	511	18	28 TYPE
Cauca	Berlin 9523		103	525	15	35 TYPE
Cauca R., W. of Medellin						
	Inst. La Salle		88	410	10	41
Honda	AMNH	22592	89	485	18	27
"	MCZ	9316	92	325	12	27
Medellin	AMNH	12978	96	540	25	22
Cúcuta	MCZ	24524	91	580	30	19
"	MCZ	24525	92	140	8	17
Bogotá (?)	AMNH	23418	86	440	14	31
"	"	23419	—	470	15	31
"	"	23420	—	445	18	25

			prim.	lgth.	diam.	l/d
Quesada R., Atrato R.						
	AMNH	49978	90	440	18	24
Sopleviento	U. Mich.	60881	87	310	20	15
"	"	"	88	250	14	18
"	"	"	86	285	14	20
Barranquilla	Hamburg	335	87	285	13	22
Venezuela:						
Maracaibo	Hamburg	823	97	345	15	23
				COTYPE *venezuelense*		
Trinidad:						
————	Dresden	639				
South America:						
————	Vienna		105	615	23	26
"Belize"	USMN	30534	92	325	12	27

It has been reported from Puerto Berrio, on the Magdalena, by Peracca (1914).

Typhlonectes kaupii (Berthold)

1859. *Caecilia Kaupii* Berthold, Nachr. Ges. Göttingen, p. 181.
1867. *Siphonops Kaupii* Keferstein, idem, p. 361.
1891. *Typhlonectes kaupii* Boulenger, Ann. Mag. Nat. Hist. (6), **8**, p. 457; 1895, Proc. Zool. Soc. London, p. 411; Nieden 1913, Gymnophiona, p. 23.
1877. *Caecilia dorsalis* Peters, Mon. Ak. Berlin, p. 459, f. 1–3 (Angostura, Ciudad Bolivar, Venezuela).
1879. *Typhlonectes dorsalis* Peters, Mon. Ak. Berlin, p. 941; Boulenger, Cat. Batr. Grad. Brit. Mus. (2), p. 103.
1912. *Thyphlonectes dorsalis* Fuhrmann, Mem. Soc. Sci. Neufchatel **5**, p. 124, f. 7.
1937. *Chthonerpeton microcephalum* Miranda Ribeiro, O Campo, May, p. 66.

Type. Not seen; in Göttingen Museum.

Type locality. Angostura, Venezuela [now Ciudad Bolivar].

Range. Venezuela to Brazil and Peru; specifically, from Ciudad Bolivar to Para, Matto Grosso, Iquitos, and middle Ucayali.

Diagnosis. A Typhlonectes with dorsal fin almost to head; head very small; tentacle close behind nostril; anal disk very large; primaries 88–104.

Description. No trace of secondaries; primaries 88–104, all complete; eye visible; dorsal fin or keel beginning on the neck; body very com-

pressed posteriorly; anus in the hinder part of a large sucking disk (much larger than head in ANS 4926; 5½ mm. in Berlin 10104); 1/d difficult to measure, approximately 20–36; smallest seen 167 mm. long; largest 695 mm. long; light brown, primaries blackish.

Habits. The specimen from Manáos was taken "under stones in 4 inches of water near rock ledge of river." That from Belém was from "docks in river."

Remarks. This is the most specialized of the group in compression of body, extent of fin, and size of anal disk. The complete folds seem more primitive than those of the others, but in all other ways it is much the most specialized. The type of *kaupii* had 104 primaries, two more than any I have seen.

Specimens seen, 19, as follows:

			prim.	length	diam.	1/d
Venezuela:						
Ciudad Bolivar	Berlin	10104	96	600	25	24
					TYPE *dorsalis?*	
" "	Hamburg	336	(head only)			
Angostura	Berlin	9092	102	270	8	35
					TYPE *dorsalis?*	
Orinocó R.	Hamburg	489	101	420	?	?
Guiana:						
————	ANS	4927	98	300	15	20
Brazil:						
Para	Hamburg	1928	98	335	13	25
Para, Belém	Carnegie	2908	92	410	7–14	28
R. Negro, Manáos	"	2906	88	172	6	28
"Brazil"	Vienna		?	480	?	?
"	ANS	4926	92	405	14	29
No locality	BMNH	98–10–17–7	93	167	6	28
" "	"	98–10–17–8	96	260	11	24
Peru:						
R. Ampiyacu, near Pebas						
	USNM	101105	95	425	16	27
Iquitos	AMNH	42853	99	545	15	36
"	AMNH	42854	98	545	19	29
San Antonio, Rio Itaya						
	AMNH	42857	96	695	20	35
Rio Pisqui (mid. Ucayali)						
	AMNH	42856	98	505	14	36

No locality:

		prim.	lgth.	diam.	l/d
BMNH	98-10-17, 7	93	167	6	28
"	98-10-17, 8	96	260	11	24

Note. Peters (1877) gives 99 primaries for the type of *dorsalis*, and says it was 265 mm. long, diameter 7 mm. This fits pretty well to my count and measurements for Berlin 9092 and would seem to make that specimen the type were it not that Berlin 10104 is labeled "type." Probably it is best to regard them as cotypes.

Dr. Joseph Bailey very kindly furnished me with a copy of the description of *Chthonerpeton microcephalum* Miranda Ribeiro, and having examined the type, wrote me that it was a Typhlonectes. The description fully confirms this and indicates 92 primaries, a length of 560 mm., a diameter of 23 mm., and a length/diameter ratio of 24. These counts fall within the known variation of *kaupii*. The description mentions the small head, the complete dorsal fin fold, and the very large anal disk.

The type came from Matto Grosso collected by Rondon. Bailey writes me that "the Matto Grosso material all came from the northern and western sections of the state, and the snake material has a large number of Amazonian elements in it. I think most of it came from the Serra de Parecis or along what is now Rio Roosevelt."

INCERTAE SEDIS

"Siphonops syntremus" Cope

1866. *Siphonops syntremus* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 129.
1879.? *Typhlonectes syntremus* Peters, Mon. Ak. Berlin, p. 942.
1885.? *Dermophis syntremus* Cope, Proc. Amer. Phil. Soc. **22**, p. 171.

As Cope is the only herpetologist known to have examined the unique type of his *Siphonops syntremus*, I quote his remarks:

"A collection . . . . . from Belize from Dr. Parsons." "The same correspondent sends from the neighboring region of Honduras . . . . . *Ninia collaris* . . . . . and *Rhegnops visoninus*." "*Siphonops syntremus* sp. nov. This species differs from the four hitherto known [*Siphonops annulatus*, *Siphonops brasiliensis*, *Chthonerpeton indistinctum*, *Gymnopis mexicanus*, all considered as Siphonops in 1866] in the close approximation of the narial and tentacular openings; the latter lie a little behind the former, and are slightly larger. The minute eyes are just visible; the internal nares are some distance behind the palatine arch.

Muzzle projecting, obtuse in profile; from above narrowed, rounded. Teeth large, five on each ramus mandibuli. A gular, and strong post-gular fold; 130 annular plicae, which are complete, except some slight ventral interruption anteriorly; the posterior third of the length with intermediate annuli, which are at first lateral only, then complete above, entirely complete on the terminal inch; the whole number will then be about 170 annuli. Form of body rather slender; tail depressed at end, short, acuminate. Color dark plumbeous, annuli yellow lined; head yellowish brown. This species resembles the *Caecilia ochrocephala* [described in the same paper], but is primarily distinguished by the position of the foramen, and of the inner nares, also by the color and character of the annuli."

Under *Dermophus syntremis*, in 1885, Cope says "I refer this species here provisionally only, as I have not been able to find the type specimen. Belize."

If it were not for this second statement the arrangement of the species in the original paper would tend to give the impression that the provenance of *syntremus* was "the neighboring region of Honduras."

If the description was accurate *syntremus* belongs to none of the species (or, indeed, none of the genera) listed in this paper. No other American form has the combination of the tentacle position of Typhlonectes or Chthonerpeton, with the primaries (130) and secondaries (40) of a Gymnopis or a Caecilia, the teeth of a Caecilia, and the "short, acuminate" tail of a Rhinatrema. As described, the species demands a new genus for its reception.

We have no right to assume that the description was inaccurate. *Caecilia ochrocephala* was described in the same paper, the type is extant, and the description is very accurate.

If the description was inaccurate, it is possible that it dealt with a specimen of *Gymnopis oligozona* (primaries 130–135, secondaries 62–74) from the same general area. *G. oligozona* was described from a specimen without data, by Cope, in 1877, and it is barely possible that the type of *oligozona* was previously the type of *syntremus*.

The National Museum (which contains the Parsons collection) has a specimen of *Typhlonectes compressicauda natans* labelled "Belize." This might, as a remote possibility, have been the type of *syntremus*.

No measurements were given for *syntremus*.

I cannot place this species in any genus known to me. I do not wish to name a new genus on the basis of a single unexamined specimen. I therefore merely set down the pertinent facts and refrain from any action.

Date Due